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ISOLATED TRAUMATIC PROXIMAL TIBIOFIBULAR JOINT DISLOCATION: CLINICAL-RADIOLOGICAL CORRELATION AND LITERATURE REVIEW

Izolirana traumatska dislokacija proksimalnog tibiofibularnog zgloba: kliničko-radiološka korelacija i pregled literature

Renato Igrec[1], Jasminka Igrec[2], Goran Kozjak[1], Ivona Petran-Kozjak[3]

Abstract

A disruption of the proximal tibiofibular joint has been considered a rare and uncommon condition with only few cases reported in literature. Four types of instability or disruption of the proximal tibiofibular joint are classified in literature as subluxation, anterolateral dislocation, posteromedial dislocation, and superior dislocation.

We report a case of a 26-year-old soccer player injured during a match. The diagnosis of the anterolateral proximal tibiofibular joint dislocation was established after clinical examination and was also confirmed radiologically.

The objective of this paper is to elaborate the mechanism of injury, nonoperative protocols, surgical techniques, rehabilitation schedules and sports guidelines after proximal tibiofibular joint dislocation.

Keywords

tibiofibular joint, proximal, dislocation, anterolateral

Sažetak

Disrupcija proksimalnog tibiofibularnog zgloba je rijetka i neuobičajena ozljeda uz do sada nekolicinu slučajeva opisanih u literaturi. Četiri tipa instabiliteta ili disrupcije proksimalnog tibiofibularnog zgloba klasificirana su u literaturi kao subluksacija, anterolateralna dislokacija, posteromedijalna dislokacija i proksimalna dislokacija.

Ovo je prikaz slučaja 26-godišnjeg nogometaša ozlijeđenog tijekom nogometne utakmice. Dijagnoza anterolateralne dislokacije proksimalnog tibiofibularnog zgloba postavljena je tijekom kliničkog pregleda i potvrđena radiološkom obradom.

Cilj ovoga rada je opisati mehanizam ozljede, konzervativno liječenje, kirurške tehnike, plan rehablitacije i povratak sportu nakon dislokacije proksimalnog tibiofibularnog zgloba.

Ključne riječi

tibiofibularni zglob, proksimalni, dislokacija, anterolateralna

Introduction

Proximal tibiofibular joint (PTFJ) is a diarthrodial synovial joint of a planar type through which the medial fibular facet articulates with the posterolateral tibia [1–4]. It is an inherently stable joint due to its bony congruity, capsuloligamentous and muscular support, and protected position behind the tibia. Slight translations and rotations occur within the PTFJ during regular knee and ankle motions imparting some flexibility during ankle movements [2, 5–7]. This synovial articulation between the proximal tibia and fibula may communicate with the knee joint in 10% of adults [2, 3, 8].

First described by Lyle in 1925, the disruption of the PTFJ has been considered a rare and uncommon condition [9, 10]. In literature four types of instability or disruption of the PTFJ are classified as subluxation, anterolateral dislocation, posteromedial dislocation, and superior dislocation [11].

The etiology of subluxation or dislocation of the PTFJ may be traumatic or pathological. Usually it is an isolated injury. However, certain underlying pathological conditions may predispose the proximal end of the fibula to dislocation in a small number of patients such as rheumatoid arthritis, septic arthritis, osteomyelitis, a below-the-knee amputation, an osteochondroma, ligamentous hyperlaxity and muscular dystrophy [2, 11, 12–16]. Differential diagnosis of nontraumatic cases includes iliotibial band syndrome, lateral meniscal pathologic conditions (instability and cysts), tibiofemoral joint osteoarthritis, popliteus tendinopathy patellofemoral pain syndrome, snapping biceps femoris or popliteus tendons, and peroneal nerve compression syndrome or neuritis. All

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of these cause lateral knee pain, and in trauma cases lateral meniscal tear [17, 18].

Traumatic PTFJ dislocation is often unrecognized or misdiagnosed during the initial diagnosis although it is commonly present in athletic injuries, parachute landings and wide variety of sport activities such as football, soccer, rugby, wrestling, gymnastics, judo, board-jumping, water skiing and skiing [2, 19–24].

The traumatic conditions simultaneously present may include twisting injuries, injuries that tear the capsule and surrounding ligaments (posteromedial dislocation), injuries caused by direct blow or adduction of the lower leg with knee flexion (anterolateral dislocation), a slipping injury in which the knee is flexed under the body and the ankle inverted, multiple trauma of the ankle or tibial plateaus (superior dislocation). This type of injury is easily missed on plain radiography. Radiography of the normal PTFJ outlines a consistent relationship between the proximal portions of the tibia and fibula (Figure 1a, 1b). The disruption of this normal relationship is indicative of anterolateral or posteromedial subluxation or dislocation (Figure 2a, 2b). If there is a clinical suspicion and plain radiograms show no abnormality, computed tomography is the diagnostic method utilized [25]. Careful evaluation of the distal syndesmotic ligaments and the interosseous membrane is important because the mechanism of trauma can also cause a disruption of the distal tibiofibular syndesmosis [24]. Controversy exists whether early mobilisation or casting is the most appropriate course of action [26].

Case report

We report a case of a 26-year-old soccer player injured during a match. The patient was complaining of pain in the area of the fibular head and newly emerged paresthesias along the distribution of the superficial peroneal nerve. Clinical examination showed fibular head luxation and no pathologic findings of the knee and ankle joint, circulatory status likewise. Anteroposterior and laterolateral radiograms confirmed the diagnosis of anterolateral dislocation of the fibular head in the proximal tibiofibular joint (Figure 2a, 2b). Closed manual reduction was implemented in the short term by intravenous sedation. Control radiograms in two projections show normal position of the articular surfaces of the right PTFJ (Figure 1a, 1b). The patient was further advised to take painkillers if needed, to walk on crutches with no load on the right leg, mostly on bed rest with leg elevated. On early follow up, two days after, the patient informed about slight soreness in the area of the fibular head present during internal rotation of the knee. External rotation was painless. Ultrasound examination of the right knee showed barely discernible edema of the soft tissues surrounding PTFJ. Immobilization was removed and the patient was advised to wear an elastic bandage, while there was edema of the soft tissues, and to use crutches if necessary along with strengthening exercises starting in seven days. Physical activity was restricted for the following three weeks.

Discussion

Anterolateral dislocation of the PTFJ is the most frequent among all traumatic PTFJ disruptions [2, 12, 27, 28]. Most of these isolated dislocations occurred during athletic activity (violent, twisting motion) while some are associated with another complex skeletal injury [12, 29, 30].

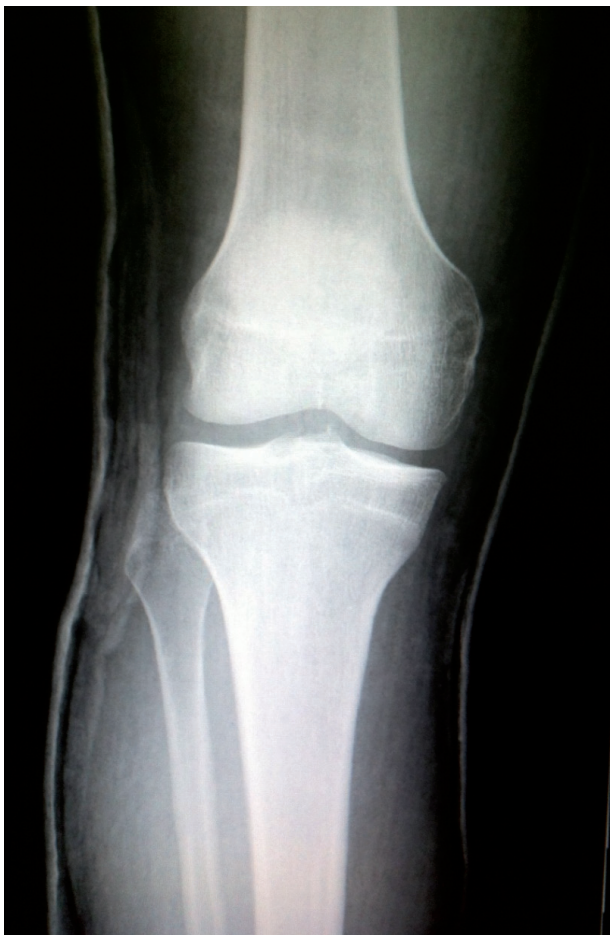
Usual mechanism of anterolateral dislocation is a combination of flexion of the knee and concomitant twisting of the tibia while the foot is fixed in inversion which pushes the proximal end of the fibula out laterally, when the violently contracting muscles pull the fibula forward [12]. The patient with this type of injury usually complains of severe pain and tenderness over the proximal part of the fibula. Some patients emphasize the pain in lateral popliteal fossa along the area of the stretched biceps tendon which can be accentuated by dorsiflexing and everting the foot [16, 27]. On physical examination there is a bony prominence laterally of the presumed fibular head position. Surrounding soft tissue shows little swelling or ecchymosis and there are no significant effusions or internal knee instability. There may be transient paresthesias along the distribution of the peroneal nerve [31–34].

Comparison of radiographic views is often necessary to confirm the diagnosis. In anterolateral dislocation on the anteroposterior view, the fibular head is displaced laterally and the proximal interosseous space is widened, the fibular head may no longer overlap the lateral margin of the lateral tibial condyl. The lateral view shows that the fibular head is displaced forward, while the majority of the fibular head is located anterior to the posterior margin of the tibia.

Acute anterolateral dislocation can usually be treated successfully by closed reduction under adequate muscle relaxation. In literature variations of manipulation have been described. The most satisfactory method appears to be eversion and dorsiflexion of the foot and flexion of the knee to at least 70 degrees. Direct pressure is then applied to the fibular head to move it to the apex of the lateral tibial ridge at which point it usually snaps back into place [11, 12]. Treatment after closed reduction consists of a short-term plaster cast followed by an elastic bandage while most of the authors allow the patients to mobilize with a support of a bandage for six weeks and sporting activities restriction for the following six weeks [16, 19, 27, 35]. If stable reduction and normal pain-free knee and ankle movements are present, immobilization is unnecessary [16].

Figure 1a. Control radiographs (through immobilization material) show normal position of articulation surfaces of tibia and fibula in the proximal tibiofibular joint where PTFJ is located inferior and slightly medial to the lateral aspect of the lateral tibial condyle

On an anteroposterior radiograph the medial aspect of the fibular head, the articulating surface, crosses the lateral border of the tibia.



If no improvement is noted, surgical intervention can be considered after six months of conservative treatment [35]. Open reduction and stabilization of the joint with repair of the injured capsule and ligaments is recommended using either the tendon of the biceps femoris muscle (Weinert and Giachino's technique) or a portion of the iliotibial tract [21], or temporary (three to six months) fixation using a screw together with release of the peroneal nerve [16, 17, 20, 21, 36–42]. As an alternative, if the closed reduction is not stable, a temporary Kirschner wire may be used [17, 19, 22, 43]. Two emerging methods for patients with recurrent post-traumatic instability of the PTFJ are repairs using gracilis autograft [44, 45] or autogenous semitendinosus tendon [46]. Fibular head resection or PTFJ arthrodesis is indicated in cases with chronic pain and instability [11, 27, 28]. In patients who have undergone arthrodesis of the PTFJ resection of the fibular head or resection of a segment of the proximal fibula below the arthrodesis can restore some rotatory function of PTFJ and avoid ankle pain [12, 28]. The TightRope technique for fixation of PTFJ injuries also proved to be an effective percutaneous fixation technique [39, 47, 48].

Due to this case report as the treatment of acute anterolateral dislocation of PTFJ, we have chosen closed reduction with short term immobilisation with an elastic bandage while the local swelling was present and the patient was experiencing pain. He was restricted from all sports activities for two to three weeks after the injury.

We can conclude that this type of injury is easily missed on plain radiography. If there is a clinical suspicion and plain radiograms show no abnormality, computed tomography is the diagnostic method of choice [25]. When diagnosed, the injury should be promptly reduced in the emergency department. Missed injuries or late presentations are a potential source of chronic morbidity.

Figure 1b. Control radiographs (through immobilization material) show normal position of articulation surfaces of tibia and fibula in the proximal tibiofibular joint where PTFJ is located inferior and slightly medial to the lateral aspect of the lateral tibial condyle

On the lateral radiograph the fibular head overlies the posterior border of the tibia. Its proper position in this projection can be confirmed by identifying its relation to the lateral tibial condyle.

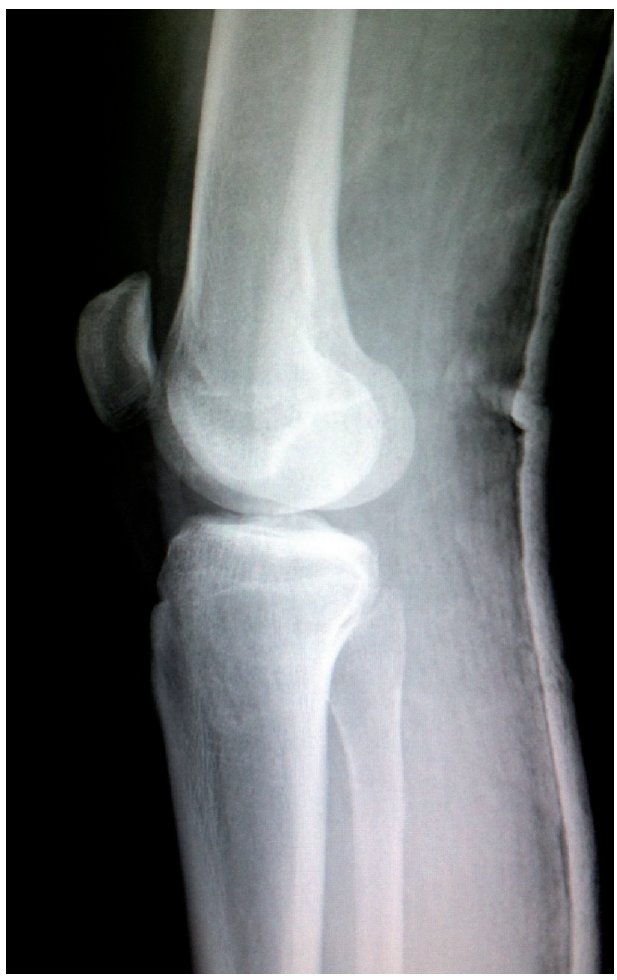


Figure 2a. Radiographic confirmation od PTFJ anterolateral dislocation.

On the anteroposterior radiograph fibular head is displaced laterally and no longer overlaps.

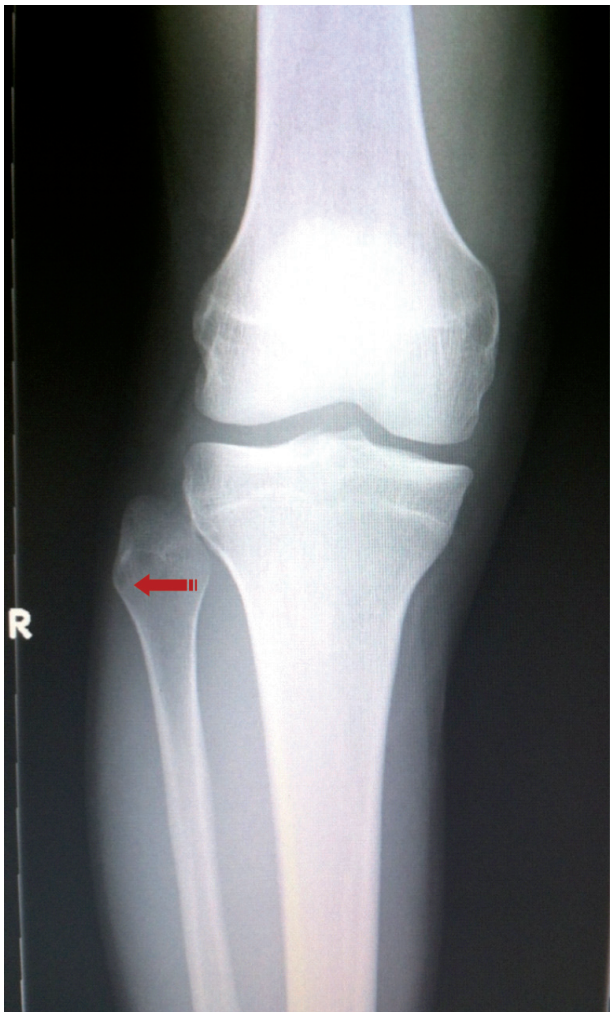
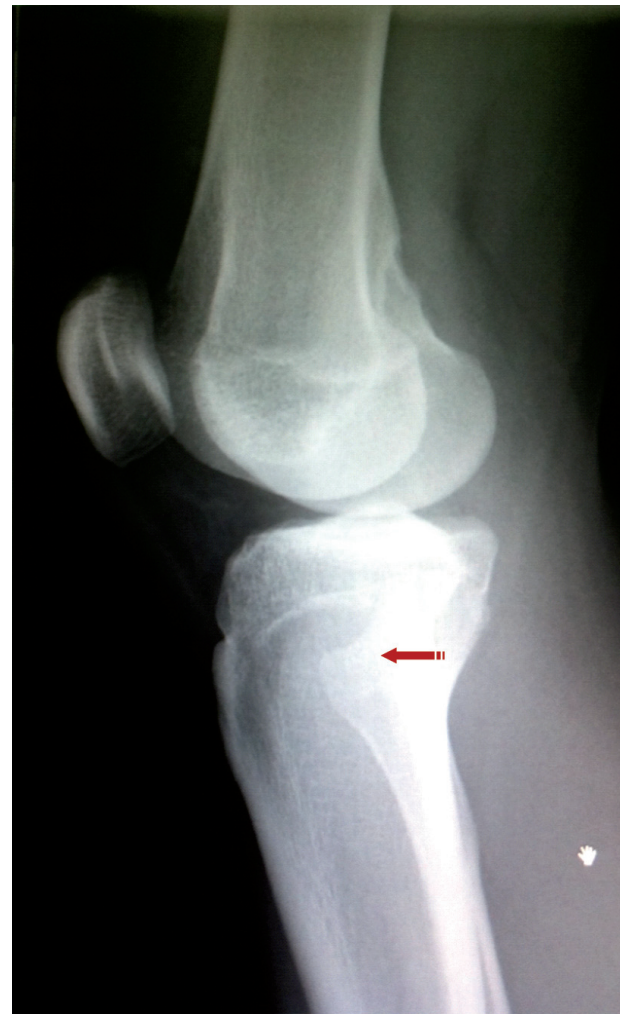


Figure 2b. Radiographic confirmation od PTFJ anterolateral dislocation.

On the lateral radiograph the majority of the fibular head is located anterior to the posterior margin of the tibia.



Conflict of interest: none

The patient gave the informed consent to the publication of the case study.

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POVIJESNI PREGLED RAZVOJA INTRAMEDULARNE OSTEOSINTEZE PRIJELOMA DUGIH KOSTIJU

Historical development of intramedullary nailing of long bone fractures

Dino Bobovec[1], Mate Majerović[2], Lana Jurlin[1]

Sažetak

Intramedularna osteosinteza ima dugu i zanimljivu povijest. Od najranijih zapisa iz 16. stoljeća sve do današnjih modernih metoda vidljiv je značajan napredak u dizajnu čavala, vijaka i materijala od kojih su izrađeni. Napredak tehnike i izbor materijala jasno prati napredak anesteziologije, asepse i antimikrobne terapije. Danas uspješna i široko prihvaćena metoda stabilizacije prijeloma dugih kostiju donjih ekstremiteta u svojim počecima nije bila prihvaćena s odobravanjem, već s velikom dozom opreza i sumnje. Tek nakon prve polovine 20. stoljeća i revolucionarnog rada njemačkog kirurga Gerharda Küntschera dolazi do smanjenja broja komplikacija i početka široke primjene modernog oblika tehnike. Ovaj rad donosi povijesni pregled napretka tehnike i korištenja intramedularne osteosinteze u liječenju prijeloma dugih kostiju.

Ključne riječi

fraktura kosti, intramedularna osteosinteza, operativno liječenje prijeloma, povijesni pregled

Abstract

Intramedullary nailing has a long and interesting history which dates back to the 16th century. Since then, this technique has gone through a significant progress which led to the common use of its modern form today. The design of nails, screws and materials they are made of has constantly been revaluated and improved. Advances in methods and materials have clearly gone hand in hand with the progress of anesthesiology, asepsis and antimicrobial therapy. Although intramedullary nailing has become standard, when it comes to the most diaphyseal lower extremity fractures, the very beginning of the method wasn't met with approval. In the first half of the 20th century, a German surgeon named Gerhard Küntcher introduced the modern form of intramedullary osteosynthesis, which has significantly diminished the frequency of complications and led to the widespread use of nailing in the treatment of long bone fractures. This paper brings the historical overview of intramedullary nailing progress and its application to the long bone fracture treatment.

Key words

bone fracture, internal osteosynthesis, operative fracture treatment, historical overview

Uvod

Intramedularna osteosinteza zbog svoje uspješnosti danas predstavlja metodu izbora u liječenju većine dijafizarnih i mnogih metafizarnih prijeloma donjih ekstremiteta. Za razliku od drugih metoda osteosinteze, intramedularni implantati demonstriraju bolje biomehaničke karakteristike zahvaljujući svojoj čvrstoći, stabilnosti i specifičnom prijenosu sila. Tehnika zahtijeva minimalan operacijski pristup, smanjujući time intraoperativni gubitak krvi i oštećenje mekih tkiva. Rana mobilizacija i rehabilitacija omogućuju ranije vraćanje pacijenta svakodnevnim aktivnostima.

Počeci osteosinteze intramedularnim čavlom i traganje za pravim materijalom

Prvi opisi liječenja prijeloma dugih kostiju donjih ekstremiteta intramedularnom osteosintezom mogu se naći u tekstovima španjolskog franjevca Bernardina de Sahaguna iz 16. stoljeća. De Sahagun, koji 1529. godine stiže kao misionar u današnji Meksiko, primjećuje da lokalno stanovništvo na neobičan način zbrinjava nesrasle prijelome dugih kostiju. Naime, astečki liječnici bi nakon bušenja rupe u kosti u intramedularni kanal nagurali dugačak, čvrsti, smolom premazani štap, koji bi takvu nesraslu frakturu učvrstio

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[1]. Europskim pridošlicama takva je tehnika bila potpuno strana jer su se srednjovjekovni principi zbrinjavanja fraktura oslanjali pretežno na trakciju i repoziciju s naknadnom fiksacijom nekom vrstom udlage. Proći će više od 200 godina dok se u europskoj medicinskoj literaturi ne pojavi prvi opis liječenja prijeloma tehnikom koja ne uključuje samo repoziciju, već i „čvrstu" unutarnju fiksaciju koštanih ulomaka.

U francuskom rukopisu iz 1775. godine prvi se puta spominje unutarnja osteosinteza metalnom žicom [2], dok se prva takva operacija pripisuje američkom kirurgu Rodgersu, koji za fiksaciju koštanih ulomaka 1827. godine koristi srebrnu žicu [3]. U narednim desetljećima takav način zbrinjavanja prijeloma ostaje popularan pa uskoro slijede opisi liječenja zatvorenih fraktura pomoću žice. Osteosinteza se sastojala od otvorene repozicije nakon koje bi uslijedila relativno čvrsta fiksacija žicom što je uz tadašnje nepoznavanje tehnika asepse i antibiotske terapije imalo veliku učestalost komplikacija [4]. Razdoblje u kojem skoro nema razlike u vjerojatnosti funkcionalnog izlječenja neovisno o metodi liječenja, bilo konzervativnoj ili kirurškoj, pokazalo se kao idealno za eksperimentiranje i isprobavanje novih tehnika.

Krajem 19. stoljeća Stimson, primijetivši da se bjelokost nakon implantacije u ljudsko tijelo djelomično resorbira, počinje primjenjivati klinove izrađene od bjelokosti za intramedularnu osteosintezu [5]. Takav način učvršćivanja prijeloma nije se pokazao dovoljno stabilnim, pogotovo na sile torzije. Djelomično rješenje tog problema nudi Gluck 1890. godine opisujući prvu metodu „ukotvljenog čavla" koristeći isti materijal za učvršćivanje intramedularnog klina. On je prvo izbušio rupe na oba distalna kraja klina kroz koje bi, nakon definitivnog uglavljivanja klina u intramedularni kanal, postavio čavle izrađene od bjelokosti [6]. Koliko je takva fiksacija stvarno bila čvrsta i stabilna može se zaključiti iz podatka da posljednjih desetljeća, unatoč korištenju najsuvremenijih materijala, jedna od najčešćih komplikacija i dalje ostaje deformacija ili pucanje ukotvljenog vijka [7]. Sama ideja o dodatnom učvršćivanju intramedularnog čavla, naravno uz promjenu materijala, nije se previše mijenjala sve do danas. Uvidjevši biomehaničke nedostatke klinova izrađenih od bjelokosti, autori počinju koristiti drugačije materijale i oblike intramedularnih fiksatora. Senn 1893. opisuje korištenje klinova izrađenih od životinjskih kostiju [8], a Hoglund 1917. koristi autologni transplantat korteksa kosti [9]. Opisujući biomehaničke principe intramedularne fiksacije u liječenju fraktura proksimalnog femura Nicolaysen predlaže najveće moguće produljenje implantata kao rješenje za povećanje stabilnosti [10].

Prvim osteosintetskim sredstvom u današnjem smislu može se smatrati Kirschnerova žica, koja je prikazana i objavljena početkom 20. stoljeća. U početku je bila korištena samo kao sredstvo za trakciju, no uviđanjem njezinih prednosti, poput manjeg oštećenja kože i kosti prilikom postavljanja te manje učestalosti infekcija, upotreba žice se širi i na osteosintezu. Kirschnerova žica se smatra prvim modernim osteosintetskim sredstvom i danas se još uvijek koristi. Uz Kirschnerovu žicu važno je spomenuti i Steinmannov čavao, koji se početkom 20. stoljeća također koristio kao sredstvo za postavljanje ekstenzija te je u upotrebi ostao do danas kao modifikacija kod vanjskih fiksatora.

Razdoblje prve polovine 20. stoljeća obilježila su dva velika svjetska sukoba. Dolaskom Prvog i Drugog svjetskog rata te naglim povećanjem broja traumatiziranih bolesnika još jednom će se pokazati istinitom stara uzrečica da je rat kirurgiji brat. Tadašnje metode liječenja traume donjih ekstremiteta odjednom su se našle u iskušenju pred enormnim brojem novih ozlijeđenika. Kirurško zbrinjavanje moralo je pratiti razvoj vatrene moći oružja kako bi povećalo šanse za preživljavanje i funkcionalni oporavak stradalnika. Takve okolnosti prisiljavale su kirurge da iznova procjenjuju tadašnje metode zbrinjavanja ozljeda i pokušaju pronaći neko novo rješenje kako bi što manje ozljeda završavalo amputacijama ili daljnjim komplikacijama [11]. Tijekom Prvoga svjetskog rata engleski kirurg Hey Groves prvi koristi metalne šipke za zbrinjavanje strijelnih ozljeda. Tehnika se sastojala u postavljanju takvih metalnih implantata u intramedularni kanal kroz inciziju napravljenu iznad strijelne rane. Autor je kao prednost metode navodio jednostavnost primjene te minimalno oštećenje kože i periosta. Zbog visokog postotka komplikacija, poglavito čestih infekcija, tehnika nije bila široko prihvaćena [12, 13]. Općenito, ovi rani pokušaji intramedularne osteosinteze traumatizirane kosti nisu izazvali oduševljenje tadašnje stručne javnosti zbog mnoštva komplikacija, poglavito infekcija, metalne elektrolize s erozijom i zamora materijala s posljedičnim pucanjem implantata [14].

Popularizacija intramedularne osteosinteze dolazi s radom Smith-Petersena 1931. godine, koji uspješno liječi frakturu vrata femura intramedularnom fiksacijom čeličnim čavlima [15]. Nekoliko godina kasnije, braća Rush opisuju također uspješno korištenje Steinmannovog čavla kao intramedularnog fiksatora u liječenju fraktura proksimalnog femura i proksimalne ulne [16, 17]. Krajem 30-ih godina 20. stoljeća konstruiran je i Rush čavao, koji je dugo godina bio jedno od vodećih osteosintetskih sredstava. Međutim, razvojem specijalnih pločica i vijaka gubi na značaju te se danas rjeđe koristi. Ove tehnike postavile su temeljna načela u liječenju fraktura intramedularnom osteosintezom, koja će svoj potpuni procvat i široko prihvaćanje postići tek u narednim desetljećima.

Küntscher i njegov utjecaj na definitivni razvoj tehnike

Gerhard Küntscher, njemački kirurg čiji je rad revolucionarizirao primjenu intramedularne osteosinteze, prvi interes za daljnji razvoj tehnike dobiva nakon rada sa Smith-Petersenovim čavlom u liječenju fraktura vrata femura. Kako bi potvrdio svoju tezu da se isti biomehanički principi mogu primijeniti kod liječenja dijafizarnih prijeloma, provodi ispitivanja na životinjskim i kadaveričnim modelima. Nedugo zatim, opisuje čelični čavao, koji je u poprečnom presjeku imao oblik slova V, a postavljao se anterogradnim pristupom u intramedularni kanal. Küntscher je zagovarao umetanje čavla u kost daleko od mjesta frakture kako ne bi dolazilo do daljnjeg oštećenja mekih tkiva i periosta, dok bi čavao predstavljao unutarnju elastičnu udlagu, koja bi održavala statičnost reponiranih ulomaka. Takav inovativni koncept predstavlja na svjetskom kirurškom kongresu 1938. godine u Berlinu. Taj podatak je malo poznat jer je rad citiran i objavljen u časopisu 1940. godine što većina smatra danom kada je isti postao poznat. U tadašnjim stručnim krugovima nailazi na veliki otpor te ga se proglašava nefiziološkim i pomodnim [18]. Tijekom Drugoga svjetskog rata Küntscher je bio stacioniran na sjevernom finskom frontu kao glavni medicinski časnik njemačke vojske gdje radi kao kirurg. Tamo uspješno primjenjuje svoju metodu na ozlijeđenim njemačkim vojnicima, ali i na ostalim traumatiziranim ratnim zarobljenicima [19]. Metoda ostaje nepoznata izvan Njemačke sve do povratka vojnika u Sjedinjene Američke Države kada se u njihovim kostima otkrivaju metalni implantati što izaziva veliki interes javnosti. Sir Watson-Jones, britanski vojni kirurg, optužuje njemačke kirurge za eksperimentiranje na zarobljenicima, a poznati magazin Time objavljuje članak pod naslovom Amazing Thighbone u kojem izražava sumnjičavost prema takvom načinu liječenja [20]. Unatoč raznim optužbama, vrijeme je pokazalo da je Küntscherova metoda bila revolucionarna jer je omogućavala potpunu mobilizaciju već nekoliko tjedana nakon ozljede uz smanjenje operativnog gubitka krvi i učestalosti postoperativnih infekcija [21].

Narednih godina dolazi do popularizacije tehnike što rezultira raznim varijacijama čavla, ponajprije u njegovom poprečnom presjeku. Soeur opisuje presjek u obliku slova U [22], a Hansen i Street poput dijamanta [23], no niti jedan ne ulazi u široku primjenu. Nakon suradnje s inovatorom i vlasnikom tvornice kirurških instrumenata Pohlom, Küntscher mijenja proslavljeni poprečni V dizajn čavla. Novi čavao bio je poprečnog presjeka u obliku lista djeteline, što je osiguravalo bolje biomehaničke karakteristike. Pohlov doprinos razvoju intramedulrne fiksacije više je puta istaknut u publikacijama Küntschera i Maatza. Nakon Pohlove smrti, na temeljima njegove tvornice 1972. godine osnovana je tvornica Howmedical, istaknuti proizvođač kirurških implantata tog razdoblja, u kojoj je novi Küntscherov čavao proizveden. Uz Küntschera, vlasnici patenta ukotvljenog čavla bili su Klemm i Schellman.

Daljnji razvoj tehnike

Fischer i Maatz 1942. godine predlažu proširivanje intramedularnog kanala i korištenje čavala većeg poprečnog presjeka kako bi se povećala kontaktna površina između implantata i kosti. Povećanjem kontaktne površine, povećala bi se i stabilnost reponiranih ulomaka [24]. Veći promjer čavlima osigurava veću čvrstoću što smanjuje učestalost komplikacija, prvenstveno pucanja čavla i omogućuje ranu mobilizaciju pacijenta. Boranje intramedularnog kanala, dovodi do bolje prokrvljenosti okolnih mišića i ostalih mekih tkiva pospješujući tako cijeljenje, što je potvrđeno brojnim istraživanjima na životinjama [25, 26]. S druge strane, boranjem intramedularnog kanala stanjuje se kortikalna kost čime se smanjuje njezina čvrstoća. Također, uništava se i intramedularni sadržaj, kao i endostealna vaskulatura, što može uzrokovati poremećaj u cijeljenju kosti, ako je pritom ugrožena i periostalna krvna opskrba.

Nova saznanja proširuju indikacije, ali i dalje jedan od glavnih problema ostaje liječenje kominutivnih prijeloma. Zbog izrazite nestabilnosti takve vrste prijeloma često je dolazilo do skraćenja, torzije i nesrastanja liječene kosti, neovisno o raznim pokušajima intramedularne stabilizacije. Rješenje problema nalazi se u ukotvljavanju intramedularnog čavla vijcima koji se postavljaju proksimalno i distalno od mjesta frakture. Princip ukotvljavanja sastoji se od pomicanja sila dalje od mjesta frakture osiguravajući tako statičnost ulomaka, a istovremeno sprečavajući torziju i skraćenje kosti. Modny i Bambara predstavljaju svoju verziju ukotvljenog čavla još 1953. godine [27], no popularizacija i široka primjena takve metode dolazi tek nakon radova objavljenih dvadesetak godina kasnije [28].

Međunarodni kirurški kongresi održani u Beču 1978. i Budimpešti 1979. godine označit će modernu intramedularnu fiksaciju kao jednostavnu i sigurnu metodu liječenja fraktura dugih kostiju, nakon čega slijedi široka primjena i međunarodno priznanje. U Hrvatskoj je ukotvljeni čavao prvi puta postavio Hančević još 1974. godine u KBC-u Zagreb. Razvoj novih čavala i vijaka, te razne modifikacije instrumentarija, proširit će indikacije ukotvljene intramedularne osteosinteze na proksimalne i distalne metafizarne prijelome. Današnja iskustva s intramedularnom osteosintezom femura i tibije više su nego zadovoljavajuća, međutim mjesta za napredak tehnike i dalje ima. U budućnosti najviše promjena može se očekivati u području materijala za izradu implantata, kao npr. biološki razgradivih polimera ili novijih legura s naprednijim mehaničkim svojstvima [29].

Zaključak

Intramedularna fiksacija ima dugu povijest te je u svom razvoju prošla brojne uspone i padove. Od drvenih štapova, preko bjelokosti i željeza, sve do današnjih najsuvremenijih legura, njezin razvoj može se shvatiti i kao potraga za odgovarajućim materijalom, budući da je sama ideja ostala praktički ista od najranijih početaka. Ponovnim otkrivanjem nekih starih ideja koje svojevremeno nisu mogle uspjeti i zaživjeti zbog okolnosti u kojima su nastale, možemo uvidjeti koliko je važno poznavati povijest medicine da bismo razumjeli njezinu sadašnjost. Unatoč ranijem osporavanju i sumnjičavosti, intramedularna osteosinteza danas je postala standard u kirurškom liječenju fraktura dijafize femura i tibije.

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ALPPS – NEW APPROACH IN THE TREATMENT OF ADVANCED LIVER TUMORS

ALPPS – novi pristup u liječenju uznapredovalih tumora jetre

Boško Romić, Ivan Romić, Mate Škegro, Tomislav Baotić, Igor Petrović, Ognjan Deban, Goran Pavlek, Jurica Žedelj

Sažetak

ALPPS (engl. *Associated* Liver Partition and Portal Vein Ligation for Staged Hepatectomy) je inovativni operacijski zahvat koji je prvi puta predstavljen 2012. godine, a u posljednje dvije godine postao je općeprihvaćen među hepatobilijarnim kirurzima diljem svijeta te su i u našoj ustanovi dosad izvedena tri ALPPS postupka. Budući da je ALPPS relativno nova metoda koja je indicirana samo kod pažljivo odabranih bolesnika, tek se očekuju studije na većem broju bolesnika, ali prema dosadašnjim rezultatima ALPPS se pokazao kao vrlo uspješna kirurška metoda koja omogućuje resektabilnost tumora koji su dosad smatrani neresektabilnima tako da omogućuje iznenađujuće brzu i intenzivnu hipertrofiju ostatnog dijela jetre.

Ključne riječi

ALPPS, resekcija jetre, hipertrofija

Abstract

ALPPS (*Associated Liver Partition and Portal Vein Ligation for Staged Hepatectomy*) is an innovative surgical procedure which was presented for the first time in 2012, and in the last two years it has become widely accepted by hepatobiliary surgeons and cosequently three ALPPS procedures have been performed at our institution so far. Considering that ALPPS is a relatively new method, indicated only in carefully selected patients, we still expect studies on a larger number of patients, but according to last results ALPPS has proved to be a very successful surgical method which allows resectability of tumors that were considered irresectable, by promoting surprisingly fast and intensive hypertrophy of future liver remnant.

Keywords

ALPPS, liver resection, hypertrophy

Uvod

ALPPS (engl. *Associated Liver Partition and Portal Vein Ligation for Staged Hepatectomy*) je inovativni operacijski zahvat koji su prvi puta 2012. godine predstavili njemački autori (Schnitzbauer et al.) u seriji od 25 pacijenata te se idućih godina uspješno implementirao u kliničkoj praksi kao jedna od metoda radikalnih resekcija jetre [1]. ALPPS je kirurška strategija koja se provodi kod bolesnika s malignim oboljenjima jetre kod kojih, s obzirom na postojanje nedovoljnog budućeg ostatnog jetrenog parenhima (engl. *Future Liver Remnant* – FLR), nije moguće provesti standardne resekcije. Radi se o svojevrsnoj modifikaciji tzv. hepatektomije u dva stadija (engl. *Two-Stage Hepatectomy*), za razliku od koje se umjesto resekcije napravi transekcija jetre uz ligaciju odgovarajućeg ogranka portalne vene.

Time je deportalizirani dio jetre prisutan u abdomenu do drugog stadija koji se tipično provodi nakon 10–14 dana kada se očekuje maksimalna hipertrofija zdravog dijela koja prema nekim studijama seže i do 180%, a u prosjeku iznosi 60–90% [2]. U drugom aktu se ligiraju odgovarajuća hepatalna arterija i hepatalni vod te se odstrani prethodno deportalizirani i atrofirani dio jetre.

Sam tehnički postupak u prvom aktu započinje slično standardnim resekcijama, ali se bolesni dio jetre ne odvaja od hepatalnih vena, arterije i hepatalnog voda, nego se napravi ligacija ogranka portalne vene te potom transekcija parenhima uz odgovarajuću hemostazu. U prvom aktu se napravi i tzv. čišćenje (engl. *clean up*) ostatnog jetrenog parenhima ako postoje resektabilne metastaze (slika 1).

Također se kod sinkronih metastaza preporučuje u prvom aktu napraviti i radikalnu resekciju primarnog tumora, najčešće kolorektalnog karcinoma [3].

Resekcijske plohe oba dijela jetre moguće je obložiti Tachosilom®, folijom ili plastičnom vrećicom kako bi se spriječio razvoj priraslica. U drugom aktu se napravi

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(proširena) hepatektomija nakon ligacije odgovarajućih hepatalnih vena i hepatalnog voda.

Najveći broj zahvata obuhvaća ligaciju desne portalne vene uz transekcijsku liniju između lijevog i desnog režnja ili po transekcijskoj liniji proširene desne hepatektomije, a rjeđe tzv. lijevi ALPPS kada se podvezuje lijeva portalna vena, a sačuva desni režanj. Opisan je i uspješan ALPPS nakon očuvanja samo jednog segmenta jetre [4]. ALPPS je moguće provesti i nakon embolizacije/ligacije portalne vene s nezadovoljavajućom hipertrofijom kontralateralnog režnja (Salvage ALPPS) [5].

U samom tehničkom smislu kod ALPPS-a postoji i nekoliko varijacija koje u pravilu ne mijenjaju osnovni postupak nego su orijentirane primjerice na način transekcije parenhima, prekrivanja reznih ploha, na upotrebu laparoskopije, upotrebe gumica koje komprimiraju parenhim jetre umjesto transekcije, ili provođenje embolizacije portalne vene umjesto kirurške ligacije.

U preglednim studijama, najčešća indikacija za ALPPS su metastaze kolorektalnog karcinoma (85%) što je razumljivo s obzirom na to da se radi o najčešćim malignim tumorima jetre, dok je od primarnih tumora najzastupljeniji hepatocelularni karcinom, a rjeđe kolangiocelularni karcinom ili neuroendokrini tumori [6]. ALPPS se kod metastaza kolorektalnog karcinoma pokazao uspješnijim u odnosu na ostale tumore, posebice kolangiocelularni karcinom kod kojeg je značajno veća stopa recidiva te manja stopa hipertrofije jetre.

Sam mehanizam brže indukcije hipertrofije ostatnog dijela jetre nije sasvim poznat, ali se smatra da postoji više faktora koji imaju ulogu u stimulaciji hipertrofije, a to su redistribucija portalnog krvotoka i povećanje metaboličkih zahtjeva u ostatnom dijelu jetre, humoralni signali deportaliziranog režnja jetre, prekidanje kolateralnog krvotoka između dva dijela jetre i kirurška trauma, koji djeluju kao stimulans za hipertrofiju te suportivna funkcija deportaliziranog dijela jetre između dva akta [7].

Naše iskustvo

U Kliničkom bolničkom centru Zagreb su unazad dvije godine provedena tri ALPPS postupka kod tri bolesnice od kojih su dvije bolovale od primarnih tumora jetre (kolangiokarcinom i hepatocelularni karcinom), dok se kod jedne radilo o sinkronim metastazama kolorektalnog karcinoma. Glavna obilježja bolesnica, tumora i postupka sažeto su prikazana u tablici 1.

Kod prve 63-godišnje bolesnice s porfirijom radilo se o hepatocelularnom karcinomu u cirotičnoj jetri koji je infiltrirao 6., 7., i 8. segment s dvije manje metastaze u 3. segmentu. Prethodno je napravljena transarterijska kemoembolizacija bez uspjeha. U prvom aktu je napravljena transekcija između dva režnja i ekscizije dva tumora 3. režnja, a drugi akt (desna hepatektomija) je uslijedio 14 dana poslije. Rani postoperativni tijek je protekao uredno uz urednu jetrenu funkciju. Tijekom 12 mjeseci praćenja kod bolesnice se verificirao recidiv hepatocelularnog karcinoma (engl. *Hepatocellular carcinoma* – HCC) u ostatnom parenhimu te kronična biliokutana fistula. CT prikaz kod ove bolesnice vidljiv je na slici broj 2.

Drugi slučaj je 62-godišnja bolesnica s karcinomom sigmoidnog kolona i sinkronim metastazama difuzno po desnom režnju i dijelom u 4. segmentu. U prvom aktu je napravljena sinkrona resekcija sigmoidnog kolona i transekcija jetre između 4. i 2/3 segmenta s ligacijom desne portalne vene. Nije bilo detektabilnih metastaza u ostatnoj jetri. Drugi akt napravljen je nakon 20 dana uz verificiranu adekvatnu hipertrofiju ostatnog režnja. Nakon osam mjeseci u praćenju kod bolesnice je verificirana diseminacija maligne bolesti u pluća i u ostatnom dijelu jetre.

Kod treće bolesnice, 45-godišnje žene s kolangiocelularnim karcinomom, napravljen je „lijevi" ALPPS zbog tumora koji je infiltrirao cijeli lijevi režanj te dio 5. i 8. segmenta. Napravljena je transekcija na resekcijskoj liniji lijeve proširene hepatektomije (između prednjeg i stražnjeg sektora desno) te je intraoperativno verificirana metastaza adenoakrcinoma na peritoneju uz desnu kruru dijafragme te uz donju šuplju venu. Period između dva akta iznosio je 14 dana. U drugom aktu verificiran je bilom te rubna nekroza desnog režnja. Bolesnica je sada šest mjeseci u praćenju, bez znakova jetrene insuficijencije, ali oporavak je kompliciran razvojem biliokutane fistule.

Bitno je naglasiti da precizna volumetrija kod bolesnica nije provedena, ali kod svih je bolesnica CT-om prije 2. akta potvrđena hipertrofija ostatnog dijela od oko 60–100% te nije bilo znakova poremećaja funkcije jetre u sklopu neadekvatnog volumena ostatnog jetrenog parenhima u postoperativnom tijeku.

Rasprava

Zanimljivost kod ALPPS-a je da taj postupak nije posljedica fundamentalnih istraživanja, primjerice na animalnim modelima, nego se može reći da je nastao slučajno kada je njemački kirurg Hans Schlitt 2007. tijekom operacije kolangiokarcinoma odustao od proširene desne hepatektomije te je odlučio napraviti palijativni zahvat; hepatikojejunostomiju i ligaciju portalne vene. Prilikom toga je radi oslobađanja lijevog hepatalnog voda od tumora, napravio transekciju kroz 4. jetreni režanj [8].

Praćenjem tog bolesnika primijećena je iznenađujuće brza i izražena hipertrofija jetre što je izazvalo entuzijazam među hepatobilijarnim kirurzima, ali broj bolesnika se idućih 4–5 godina ipak povećavao vrlo polako jer se nisu znali točni fiziološki mehanizmi i uzroci takvog stupnja hipertrofije niti je bila poznata

sigurnost same metode i njezini dugoročni rezultati.

Kada je 2012. objavljena serija od 25 bolesnika s vrlo uspješnim rezultatima, ALPPS je široko prihvaćen od kirurga kada se i broj bolesnika mnogo brže povećavao pa su prvih godina studije bile gotovo isključivo kliničkog i opservacijskog tipa, a nakon što su neke činjenice oko ALPPS-a postale neupitne, počela su se provoditi i detaljnija temeljna istraživanja kako bi se otkrili stanični i molekularni mehanizmi indukcije hipertrofije.

Indikacije za ALPPS još nisu jasno definirane te je za detaljnije smjernice bitno pričekati opsežnije studije i zaključke stručnih društava. Ipak, svi se slažu da je ALPPS složen i fiziološki zahtjevan postupak za bolesnika te bi se trebao provoditi samo kod odabranih pacijenata kod kojih nisu moguće standardne metode liječenja zbog nedovoljnog ostatnog zdravog parenhima jetre. Stoga je u individualiziranom pristupu potrebno u obzir uzeti dob i opće stanje bolesnika, pridružene komorbiditete te prisutnost difuznih bolesti jetre i ekstrahepatalne proširenosti tumora.

Smatra se da je kod zdrave jetre potrebno oko 25% ostatnog zdravog tkiva nakon resekcije kako bi se izbjeglo postoperativno zatajenje. Kod cirotične jetre i drugih difuznih bolesti te nakon neoadjuvantne kemoterapije taj postotak raste na oko 40% [9].

ALPPS stoga ima smisla provoditi kod bolesnika s manjim ostatnim volumenom od navedenog što se najčešće verificira preoperativnom CT ili MRI volumetrijom. Rasprave se vode oko toga je li ALPPS indiciran inicijalno kod tih bolesnika ili tek nakon što se procijeni da konvencionalne metode indukcije hipertofije (embolizacija/ligacija portalne vene) neće omogućiti očuvanje adekvatnog volumena jetre, odnosno nakon neuspjeha tih metoda.

Kontraindikacije za ALPPS su u pravilu jednake kao i za hepatektomije: nemogućnost radikalne resekcije primarnog tumora ili metastaza, ekstrahepatalna proširenost bolesti, teška portalna hipertenzija, anesteziološke kontraindikacije. Neki autori studija preporučuju da kolangiocelularni karcinom i starija dob (+65 godina) budu relativne kontraindikacije za ALPPS s obzirom da je kod tih skupina objavljen značajno povećan rizik mortaliteta i neuspjeha samog postupka [10].

Glavna prednost ALPPS-a je brza i izraženija hipertrofija ostatnog jetrenog parenhima u odnosu na ostale metode indukcije hipertrofije jetre. Drugi akt ALPPS-a izvodi se 7–14 dana nakon prvog što je značajno kraći period potreban za hipertrofiju u odnosu na ostale metode što je vidljivo iz slike 3.

ALPPS time omogućuje i agresivniji pristup pri metastazektomijama u budućem ostatnom parenhimu jetre. Nadalje, kao što je spomenuto, prisustvo deportaliziranog dijela u abdomenu smanjuje mogućnost postoperativnog zatajenja jetre jer se smatra da taj dio ipak ima određenu metaboličku i sintetsku funkciju te djeluje kao „pomoćna" jetra u periodu između dva akta. ALPPS također smanjuje vrijeme čekanja od resekcije do adjuvantne kemoterapije te se oba akta obično provode u istoj hospitalizaciji.

S druge strane, postoje i kritike koje se najviše odnose na potrebu izvođenja dva zahvata te na postoperativni mortalitet i morbiditet koji za tromjesečno razdoblje nakon zahvata iznosi 6–12% za stopu mortaliteta i 50–60% za stopu morbiditeta, ovisno o centru i studiji. Radi usporedbe, mortalitet kod velikih resekcija jetre iznosi 8–10%, a morbiditet oko 40%. Međutim, najveća retrospektivna studija na oko 400 ispitanika ipak pokazuje da je mortalitet značajno povećan u odnosu na standardne resekcije jedino kod bolesnika starijih od 65 godina i kod onih sa značajnim srčanim komorbiditetima [11].

Neki kritičari smatraju da se ostavljanjem tumorom zahvaćene jetre u abdomenu koja je kirurški manipulirana povećava rizik metastaziranja u periodu između dva akta. Ova teza zasad još nema znanstveno uporište te većina autora smatra da je u periodu od dva tjedna taj rizik zanemariv. Također se kao nedostatak ALPPS-a izdvaja mogućnost komplikacija vezanih za deportaliziranu jetru kao što su apsces, adhezije, nekroze ili bilijarni *leak* iz intrahepatalnih žučnih vodova.

Što se tiče intraoperativnih rizika, nije dokazana značajna razlika u intraoperativnom gubitku krvi niti intraoperativnih komplikacija između standardnih hepatektomija i ALPPS-a.

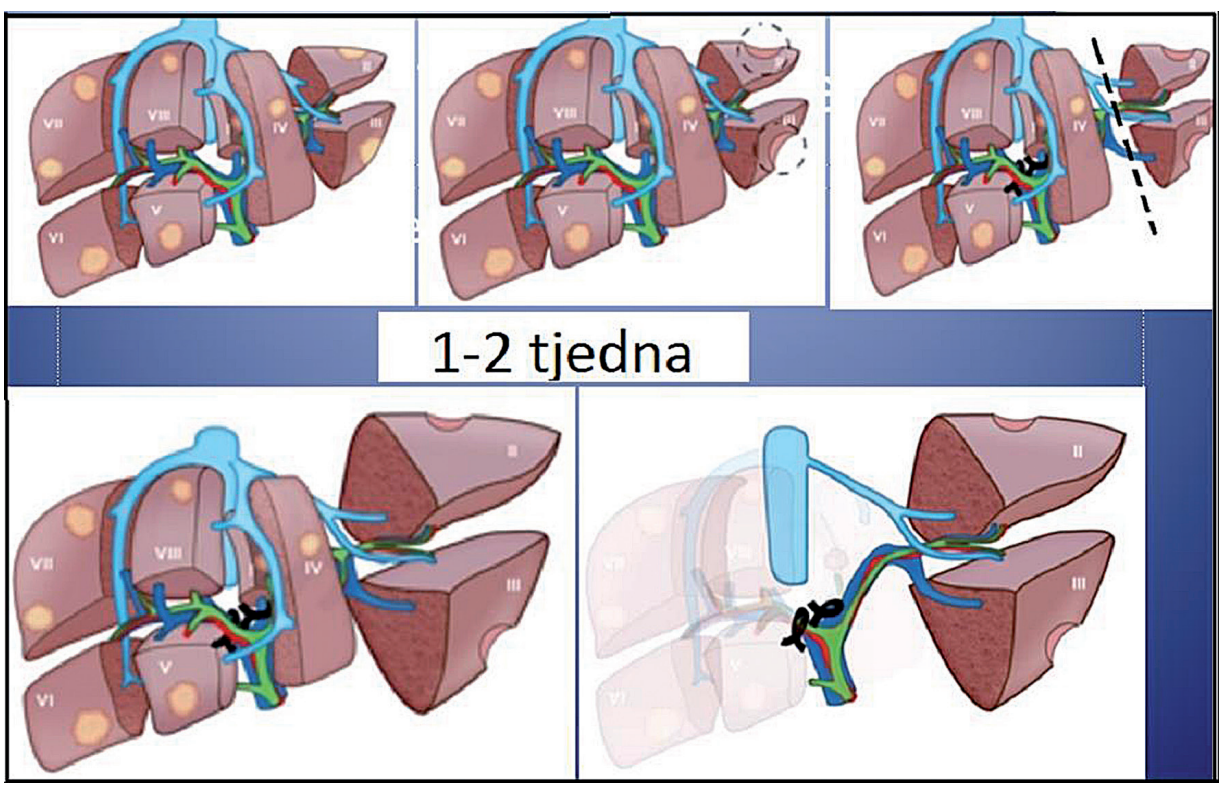
Zaključak

ALPPS je kirurška strategija u dva akta indicirana kod bolesnika s uznapredovalim malignim tumorima jetre koja je razvijena u svrhu smanjenja rizika od postoperativnog zatajenja jetre nakon radikalnih resekcija. ALPPS omogućava radikalnu resekciju tumora kod malignih oboljenja koji su se dosad smatrali inoperabilnima, a istovremeno omogućuje bržu i značajniju hipertrofiju ostatnog parenhima. S obzirom na složenost ALPPS-a i perioperativne potrebe, postupak bi se trebao provoditi kod pažljivo odabranih bolesnika, u specijaliziranim centrima s iskusnim hepatobilijarnim kirurzima te u multidisciplinarnoj suradnji s onkolozima, gastroenterolozima i radiolozima. Ohrabrujući dosadašnji rezultati postavljaju ALPPS među prekretnice hepatobilijarne kirurgije. Ipak, bitno je sakupiti kliničko iskustvo, provesti fundamentalna istraživanja te studije na većem broju bolesnika i prikazati dugoročne rezultate što će nam pomoći odrediti korist primjene ALPPS-a te definiranje kliničkih i tehničkih smjernica.

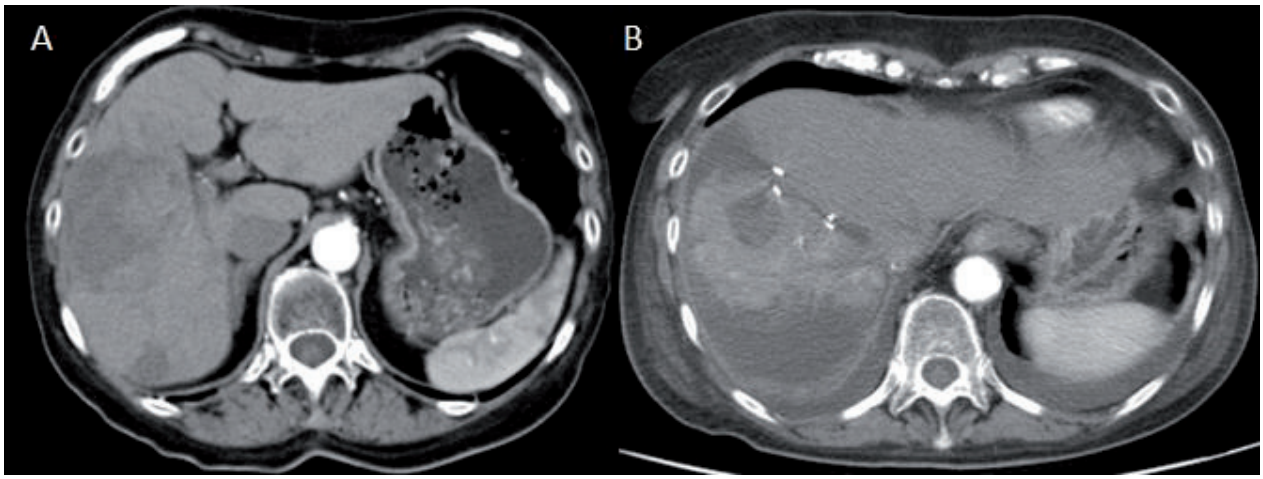
Tablica 1. Glavna obilježja bolesnika, tumora i postupka

Pacijent, dob, spol	**Vrsta tumora/ bolesti jetre**	**Lokalizacija tumora**	**Vrsta hepatektomije, dodatni zahvat**	**Period između 2 akta**	**Komplikacije**	**Dugoročni rezultat**
1) 63 godine, žensko	Hepatocelularni karcinom, porfirija, ciroza	6., 7., 8. segment te metastaze u 3. segmentu	Desna hepatektomija + metastazektomija u 3. Segment	14 dana	Biliokutana fistula	Recidiv nakon 8 mjeseci
2) 62 godine, žensko	Metastaze kolorektalnog karcinoma (sigma)	5., 6., 7., 8. i 4. segment	Proširena desna hepatektomija + resekcija sigmoidnog kolona s anastomozom	20 dana	–	Recidiv nakon 10 mjeseci, ekstrahepatalna diseminacija
3) 45 godina, žensko	Kolangiocelularni karcinom	2., 3., 4., 8. i parcijalno 5. segment	Proširena lijeva hepatektomija uz eksciziju tumora s donje šuplje vene	4 dana	Biliokutana fistula, desnostrani pleuralni izljev	6 mjeseci u praćenju, bez znakova recidiva u jetri, ali inicijalno prisutne ekstrahepatalne metastaze

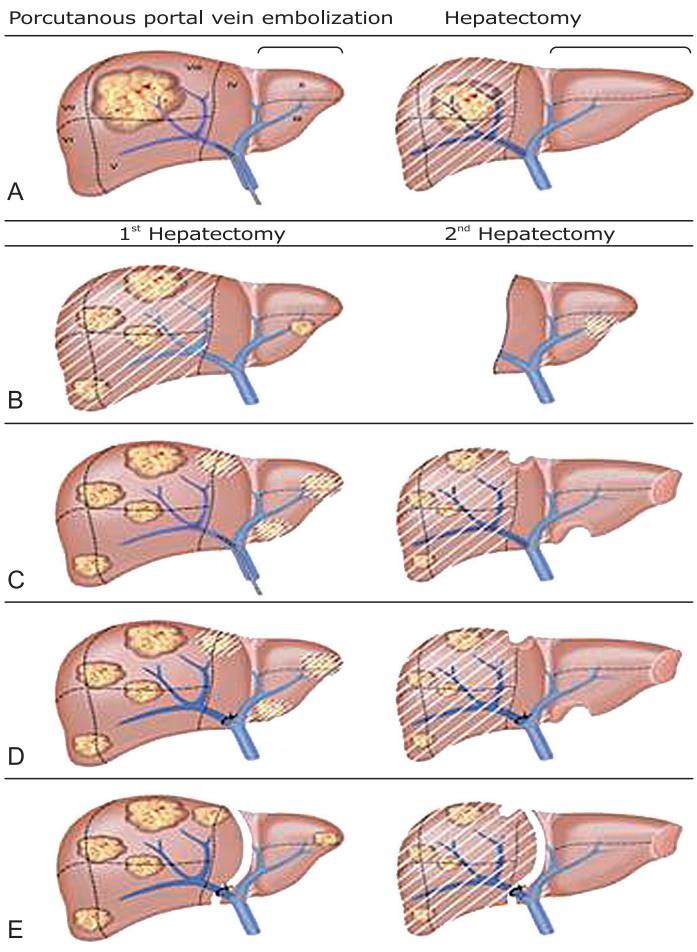
Slika 1. Shematski prikaz najčešće vrste ALPPS postupka: u prvom aktu se napravi „clean up" lijevog režnja jetre, transekcija po lateralnom rubu 4. segmenta te ligacija lijeve portalne vene. Nakon 1–2 tjedna slijedi drugi akt, odnosno proširena desna hepatektomija (preuzeto s ALPPS.net).



Slika 2. CT prikaz jetre kod naših bolesnica s opsežnim tumorom (HCC) u desnom režnju prije (A) i 10 dana nakon prvog akta ALPPS-a (B) koja prikazuje atrofiju desnog režnja, klipse na transekcijskoj liniji i značajnu hipertrofiju 2. i 3. segmenta jetre.



Slika 3. Shematski prikaz dosadašnjih metoda indukcije hipertrofije u usporedbi s ALPPS-om uz predočenje vremenskog okvira između dva akta i prosječne hipertrofije ostatnog jetrenog parenhima za pojedni postupak (preuzeto sa http://www.livertumors.uzh.ch/index.html).



Percutaneous embolization

40-50% hipetrophy
Period: 6-12 weeks

2-staged hepatectomy

30-40% hipetrophy
Period: 6-10 weeks

2-staged hepatectomy + portal vein embolization

40-60% hipetrophy
Period: 12-16 weeks

2-staged hepatectomy + portal vein ligation

40-50% hipetrophy
Period: 4-6 weeks

ALPPS

80-120% hipetrophy
Period: 1-2 weeks

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KIRURGIJA U DNEVNOJ BOLNICI

Outpatient surgery

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Sažetak

Podloga: Dnevna bolnica (DB) je oblik organizacije, ali i način pružanja dijagnostičko-terapijskih postupaka izvanbolničkih bolesnika uz dnevni boravak u bolnici (u trajanju do 22 sata). Dnevna bolnica može se organizirati kao organizacijski dio pojedine djelatnosti u bolnici, poliklinici i trgovačkom društvu za obavljanje zdravstvene djelatnosti. Vlada Republike Hrvatske pravilnikom propisuje minimalne uvjete za rad u Dnevnoj bolnici, a Hrvatski zavod za zdravstveno osiguranje (HZZO) ugovara kirurške postelje, plaća usluge i prati iskorištenost ugovorenih kapaciteta.

Metode: Autori u ovom radu dostupnom stručnom literaturom, pravilnicima i statističkim izvješćima analiziraju brojnost i iskorištenost posteljnih kapaciteta kirurških dnevnih bolnica u javnom zdravstvenom sustavu Republike Hrvatske. Analizirano je razdoblje od 2013. do 2014. godine.

Rezultati: Od sveukupno 25 219 bolničkih postelja u Hrvatskoj, u 2015. godini HZZO je ugovorio 3811 postelja dječjih bolnica (278 za potrebe opće i 33 za potrebe dječje kirurgije). U 2014. godini bolnice su imale 155 ugovorenih postelja opće i 13 postelja dječje kirurgije. U 2013. godini, bilo je 20 930 dana liječenja u dnevnim bolnicama opće kirurgije i 2844 dana u dječjoj kirurgiji, a u 2014. godini bilo je 22 946 dana liječenja u dnevnim bolnicama opće kirurgije i 2488 dana u dječjoj kirurgiji.

Zaključak: Ukupno sudjelovanje kirurških postelja dječjih bolnica u posteljnom kapacitetu naših bolnica je niska, a popunjenost tih kapaciteta na godišnjoj razini kreće se u rasponu 54–87%. Postelje dječje kirurgije u dječjim bolnicama većim se postotkom koriste nego one opće kirurgije. Zakonodavac i HZZO učestalo mijenjaju pravilnike kojima propisuju okvire rada kirurške dnevne bolnice, a bolnice teško prate te zadane okvire minimalnih uvjeta.

Ključne riječi

jednodnevna kirurgija, dnevna bolnica

Abstract

Background: Day Hospital (DH) is a type of organization for providing diagnostic and therapeutic outpatient procedures for patients who are hospitalized and discharged within one day (within 22 hours). It can be organized in a hospital, clinic or healthcare company. The government of the Republic of Croatia prescribes minimum requirements for work on an outpatient basis, and the Croatian Health Insurance Fund (HZZO) contracts the number of surgical beds, pays for the provided services and monitors the hospital bed usage.

Methods: The authors, using available literature, regulations and statistical reports, analyzed the number and hospital bed usage in surgical DH units in the public health system in Croatia for the 2013/2014 period.

Results: Of 25 219 hospital beds in Croatia, in 2015 HZZO contracted 3811 DH beds (278 for general surgery and 33 for pediatric surgery). In 2014 there were 155 beds for general and 13 beds for pediatric surgery. In 2013 there were 20 930 days of hospitalization in general day surgery and 2844 days in pediatric day surgery. In 2014 there were 22 946 days of hospitalization in general day surgery and 2488 days in pediatric day surgery.

Conclusion: The percentage of surgical DH beds in overall number of surgical beds in our hospitals is low, and the utilization of capacity ranges from 54 to 87%. Pediatric day surgery beds are utilized better than general surgery. The Government and HZZO often change regulations regarding DH facilities. This makes it difficult for hospitals to maintain minimal requirements for the organization of surgical DH units.

Keywords

day surgery, outpatient surgery

Uvod

Dnevna bolnica (DB) je oblik organizacije, ali i način pružanja dijagnostičko-terapijskih postupaka (DTP)

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izvanbolničkih bolesnika uz dnevni boravak u bolnici, a najduže do 22 sata. Dnevna bolnica može se organizirati kao organizacijski dio pojedine djelatnosti u bolnici, poliklinici i trgovačkom društvu za obavljanje zdravstvene djelatnosti [1]. Strateški cilj Vlade Republike Hrvatske već je tijekom 2014. godine bio 30% svih kirurških zahvata uključenih u listu elektivnih kirurških zahvata obavljati kao kirurške zahvate u izvanbolničkom liječenju. Izvanbolničko liječenje podrazumijeva ambulantne (AK) i jednodnevne zahvate (JK). Ambulantni zahvati su kirurški postupci prema unaprijed utvrđenoj proceduri, u pravilu u trajanju kraćem od šest sati. Svi zahvati su elektivni. Najčešće se radi o otklanjanju patoloških kožnih i potkožnih tvorbi [2]. Radi se o velikom broju kirurških postupaka, većinom su to dijagnostičke biopsije, terapijske ekstirpacije ili ekscizije benignih, displastičkih ili malignih promjena. Obračun ovih postupaka, fakturiranje usluga prema Hrvatskom zavodu za zdravstveno osiguranje (HZZO) čini se prema DTP sustavu i koeficijentu složenosti koji je svojim pravilnikom odredio HZZO (tablica 1).

Ovi zahvati izvode se u lokalnoj provodnoj ili infiltracijskoj, a kod djece u kratkotrajnoj općoj anesteziji. Terapijski postupak koji u pravilu traje duže od šest i kraće od 24 sata naziva se jednodnevna kirurgija [3]. Za jednodnevnu kirurgiju potrebna je u potpunosti opremljena operacijska sala, prema normativima prostornog uređenja zdravstvenih ustanova u Republici Hrvatskoj. Zahvati se izvode u svim oblicima anestezije, a najčešće se kombiniraju. Hrvatski zavod za zdravstveno osiguranje odukom o vrstama i načinu fakturiranja pojedinih kirurških postupaka, izravno je odredio koji su to postupci JK-a koji se kod nas mogu izvoditi u dnevnoj bolnici (tablica 2).

Organizacija kirurških dnevnih bolnica, obavljanje zahvata, ugovaranje djelatnosti i mjesta izvršenja tih usluga u našim zdravstvenim ustanovama po mnogočemu se razlikuju. Posljednjih desetak godina kod nas se može pratiti porast interesa za JK i AK. Budući da se radi o relativno novom pristupu kirurgiji u ustanovama koje su u državnom vlasništvu, a zakonodavac često mijenja i popravlja definicije, pravilnike, uvjete i naputke, ne čudi kako se o ovoj temi kod nas gotovo uopće ne piše, posebice u stručnoj publicistici. Uz to broj ugovorenih postelja dnevne bolnice u kojoj se obavljaju kirurški postupci ovisi od bolnice do bolnice. Čini se kako se i ti ugovoreni kapaciteti koriste u različitoj mjeri. Autori u ovom radu analiziraju javnomedicinska zbivanja u vezi s AK-om i JK-om, na ugovorenim posteljama dnevne bolnice, njihovu iskorištenost i komentiraju moguća poboljšanja rada u kirurškim dnevnim bolnicama.

Cilj rada

Cilj rada je dostupnom stručnom literaturom, pravilnicima i statističkim izvješćima analizirati iskorištenost posteljnih kapaciteta kirurških dnevnih bolnica u javnom zdravstvenom sustavu Republike Hrvatske.

Metode istraživanja

Metoda istraživanja bila je pretraživanje javnodostupnih podataka, prvenstveno Ministarstva zdravlja Republike Hrvatske, Hrvatskog zavoda za zdravstveno osiguranje i Državnog zavoda za statistiku. Pregledani su svi stručni radovi publicirani kod nas koji uključuju ključne riječi „dnevna bolnica" i „jednodnevna kirurgija" (pretraživač Hrčak – Portal znanstvenih časopisa Republike Hrvatske) i „day surgery" (Pubmed). Pregledan je i internetski pretraživač Google te dostupni novinski članci o dnevnim kirurškim zahvatima i organizaciji kirurških bolnica u našim zdravstvenim ustanovama.

Rezultati

Od ukupno 25 219 bolničkih postelja u Hrvatskoj, u 2015. godini HZZO je ugovorio 3811 postelja dnevnih bolnica, od toga 278 za potrebe opće i 33 za potrebe dječje kirurgije [4]. Godinu ranije, tj. 2014. godine, bolnice su imale 155 ugovorenih postelja opće i 13 postelja dječje kirurgije. U izvješću HZZO-a za 2013. godinu bilo je 20 930 dana liječenja u dnevnoj bolnici opće kirurgije i 2 844 dana liječenja u dječjoj kirurgiji. Za 2014. godinu broj dana ležanja u dnevnoj bolnici opće kirurgije bio je 22 946, a za dječju kirurgiju 2 488 (tablica 3).

Na portalu Hrčak postoje dva stručna rada na temu dnevne bolnice (ključna riječ „dnevna bolnica"). Jedan govori o pedijatrijskoj dnevnoj bolnici [5], dok drugi komentira dnevnu bolnicu s psihijatrijskog aspekta [6]. Pretraga s ključnom riječi „jednodnevna kirurgija" pronašla je dva članka, po jedan kirurški [7] i anesteziološki [8]. Pregledom Pubmed baze podataka (ključna riječ „day surgery"), nalazimo da su hrvatskim časopisima u posljednje četiri godine objavljena tek dva stručna članka [9, 10].

Rasprava

U Republici Hrvatskoj, 2015. godine oko 15% ukupnog bolničkog posteljnog kapaciteta čine ugovorene postelje dnevne bolnice. Broj ugovorenih postelja dnevne bolnice opće i dječje kirurgije, prema mišljenju Vlade Republike Hrvatske, neravnomjerno je raspoređen po bolnicama [11]. Neke su opće bolnice ugovorile više od pola svog bolničkog posteljnog kapaciteta, a neke kao npr. OB Vukovar imaju više ugovorenih postelja dnevne bolnice nego jedan klinički bolnički centar. Nedavno, 2013. i 2014. godine, neke naše bolnice nisu imale niti jedan ugovoreni kirurški krevet dnevne bolnice. Ugovoreni broj kirurških postelja dnevne bolnice za 2013. naglo raste tek 2015. godine kada se udvostručio. Prosječna iskoristivost tih

kirurških postelja dnevne bolnice na razini Republike Hrvatske je za 2013. godinu 70,5%, a za 2014. godinu 67%, no dječji kirurzi su značajno racionalnije koristili kapacitete. Iako su prve kirurške dnevne bolnice, ustrojene kao organizacijska jedinica klinike ili zavoda počele s radom 2008. godine, tek posljednjih godinu dana ustrojavaju se nove dnevne bolnice kirurških djelatnosti. Stručnih izvješća o ishodima kirurškog liječenja u dnevnim bolnicama kod nas gotovo nema. U posljednje četiri godine objavljena su svega tri stručna članka u indeksiranim časopisima, na temu kirurška dnevna bolnica. Brojni su razlozi zašto je to tako. Razvoj dnevnih bolnica i njihovo uhodavanje u svakodnevnoj praksi prvenstveno je zadaća njenih vlasnika, tko god oni bili. U privatnoj zdravstvenoj praksi, tijekom desetak godina gotovo sve kirurške poliklinike rade AK i JK. Lobiranjem kod zakonodavca i stručnih tijela, pravilnici koji se odnose na rad i organizaciju dnevnih bolnica u nekoliko su navrata mijenjani. Prvi puta zakonskim aktom dnevnu bolnicu Vlada Republike Hrvatske (ministar N. Ljubičić) spominje 9. listopada 2007. godine. Tada je objavljen Pravilnik o uvjetima za ustroj zavoda i odjela u kliničkim bolničkim centrima i kliničkim bolnicama. Dnevna bolnica definirana je kao ustrojstvena jedinica za pružanje dijagnostičko-terapijske zdravstvene zaštite izvanbolničkih bolesnika uz kratkotrajni boravak bolesnika u bolnici. Dnevna bolnica klinike, odnosno zavoda, mora imati najmanje pet bolesničkih postelja [13]. Vlada Republike Hrvatske (ministar D. Milinović) 24. svibnja 2011. donosi Pravilnik o minimalnim uvjetima u pogledu prostora, radnika i medicinsko-tehničke opreme za obavljanje zdravstvene djelatnosti. Članak 33. ovog Pravilnika u prvom stavku određuje kako se u DB-u osigurava boravak pacijenata ne duže od 16 sati u tijeku jednog dana. DB mora imati bolesničku sobu od najmanje 12 m^2 te dodatno 6 m^2 po svakoj dodatnoj bolesničkoj postelji ili sjedećem mjestu [14]. Vlada Republike Hrvatske (ministar R. Ostojić) dana 4. prosinca 2013. objavila je novi Pravilnik o uvjetima za unutarnji ustroj kliničkih zdravstvenih ustanova. U tom pravnom aktu članak 8. daje novu definiciju dnevne bolnice definirajući je kao oblik organizacije i način pružanja dijagnostičko-terapijskih postupaka izvanbolničkih bolesnika uz dnevni boravak u bolnici. Može se ustrojiti na razini klinike ili zavoda ako ima najmanje 30 stolica/postelja [13]. Vlada Republike Hrvatske (ministar S. Varga) dana 4. prosinca 2013. donosi novi Pravilnik o izmjenama i dopunama pravilnika o uvjetima u pogledu prostora i radnika i medicinsko-tehničke opreme za obavljanje te zdravstvene djelatnosti. U tom pravnom aktu članak 18. mijenja raniji članak 33. i glasi: »Dnevna bolnica je oblik organizacije i način pružanja dijagnostičko-terapijskih postupaka zdravstvene zaštite izvanbolničkih pacijenata, uz dnevni boravak pacijenata najduže do 22 sata. Dnevna bolnica može se organizirati kao organizacijski dio pojedine djelatnosti u bolnici, poliklinici i trgovačkom društvu za obavljanje zdravstvene djelatnosti. Bolnica može organizirati dnevnu bolnicu kao organizacijski dio pojedine djelatnosti ili kao samostalnu ustrojstvenu jedinicu ovisno o potrebama djelatnosti koje obavlja. U dnevnoj bolnici koja je organizacijski, a ne zasebni dio pojedine djelatnosti, treba osigurati prostornu odvojenost za bolničke i izvanbolničke pacijente. Dnevna bolnica za kirurške djelatnosti mora imati vlastitu (jednu ili više) operacijsku dvoranu ili iznimno može koristiti operacijske dvorane centralnog operacijskog bloka. Dnevna bolnica u čijim se jedinicama priprema i dijeli hrana bolesnicima mora za to osigurati posebnu prostoriju, odnosno prostorije ovisno o potrebama bolesnika (priručna kuhinja)« [15]. U tim se definicijama mijenjaju osnovni postulati na kojima počiva rad kirurških dnevnih bolnica. Propisani minimalni posteljni i prostori uvjeti nedostižni su za sve naše bolnice [16] jer ih vlasnik (a ujedno i zakonodavac) građevinsko-financijski ne prati. Stoga ne čudi da svaka bolnica internim preraspodjelama na svoj način organizira dnevnu bolnicu, a kirurško dnevnu bolnicu nazivaju specijalističkim zavodom, odjelom, centrom, djelatnošću i dnevnom bolnicom s jednodnevnom kirurgijom. Pored zakonodavca, druga važna ustanova koja kreira stručni rad našeg zdravstvenog sustava je HZZO. Do 2005. godine, bolničko liječenje je plaćano po napravljenom trošku. Od početka 2005. godine HZZO uvodi 118 PPTP grupa (plaćanja prema terapijskom postupku) [17], a od 2009. godine po DTP-u (dijagnostičko terapijskoj skupini). Vrijednost DTS koeficijenta u razdoblju od 1. siječnja 2009. do 1. svibnja 2013. mijenjana je osam puta, a od 1. travnja 2012. uvodi se podjela na kirurški i nekirurški DTS [7]. Od 1. rujna 2013. HZZO uvodi novi model upućivanja prema kojem bolesnik u dnevnu bolnicu donosi uputnicu oznake D. Ona ima dvije supkategorije: D1 ambulantna kirurgija te D2 jednodnevna kirurgija [18]. Od 1. siječnja 2015. godine HZZO, ponovno mijenja način financiranja bolnica i dnevne bolnice. Dakle, u posljednjih deset godina, HZZO gotovo svake godine mijenja dotadašnji oblik rada, bez prethodne edukacije bolničkih liječnika koji su nositelji te djelatnosti. Najviše međunarodno stručno tijelo za djelatnost dnevne kirurgije je Svjetska udruga dnevne kirurgije (*International Association for Ambulatory Surgery* – IAAS), koja u svojim preporukama nema odrednica minimalnog broja postelja, nego se bavi postulatima struke, ekonomskom isplativošću, sigurnošću bolesnika i dobrom praksom liječenja [19]. Način na koji će se organizirati rad ambulantne i jednodnevne kirurgije prvenstveno ovisi o broju bolesnika koji će biti liječeni. Kako je Hrvatska jasno definirana brojem kirurških bolesnika, ali i geografskom rasporedom naselja, malim naporom se može doći do broja kirurškog posteljnog kapaciteta u dnevnim bolnicama Republike Hrvatske.

Prema IAAS-u, rad jednodnevne kirurgije integriran u stacionarni bolnički sustav opravdan je samo za manje bolnice [20]. Za veće bolničke sustave, npr. KBC Zagreb, jedino je opravdano jednodnevnu i ambulantnu kirurgiju izvoditi u dnevnoj bolnici koja ima vlastiti prostor, opremu i zaposlenike. Tu se mogu educirati studenti i specijalizanti, ali i istraživati komplikacije te ishod liječenja, organizaciju rada i barijere za razvoj kirurških dnevnih bolnica [21]. Treći oblik izvođenja JK-a je moguć kada nacionalna strategija, na razini više bolnica i svih subspecijalističkih djelatnosti jedne regije (npr. Zagrebačka županija), napravi potpuno opremljenu bolnicu – kiruršku dnevnu bolnicu. Primjer takve ustanove je CICA Porto, koja kirurškim zahvatima skrbi o dva milijuna stanovnika grada Porta i sjeverne portugalske regije Norte [22]. Iako se radi o velikim početnim investicijama, prema izvješću portugalskog ministra zdravlja, uloženi kapital se vraća u roku tri godine [23]. U svijetu raste broj postupaka i vrsta kirurških zahvata koji se izvode u dnevnoj bolnici, ali i nastavnih i stručnih tekstova koji podučavaju kako izvoditi jednodnevnu i ambulantu kirurgiju [24].

Zaključak

Ukupno sudjelovanje kirurških postelja dnevne bolnice u posteljnom kapacitetu naših bolnica je niska, a popunjenost tih kapaciteta na godišnjoj razini kreće se od 54 do 87%. Postelje dječje kirurgije u dnevnim bolnicama koriste se u većem postotku nego one opće kirurgije. Zakonodavac i HZZO učestalo mijenjaju pravilnike kojima propisuju okvire rada kirurške dnevne bolnice, a bolnice teško prate te zadane okvire minimalnih uvjeta. Ta kod nas relativno mlada grana kirurgije, sporo napreduje i teško se približava standardima koje navodi IAAS.

Tablica 1. Popis dijagnostičko-terapijskih postupaka (DTP) ambulantne kirurgije.

Šifra DTP-a	Naziv DTP-a	Opis DTP-a	Koeficijent
SK081	Biopsija kosti – odrasla osoba		3,85
SK082	Biopsija kosti s vađenjem koštane srži	Uključuje anesteziju	7,65
SK083	Incizija nosne sluznice	Uključuje lokalnu anesteziju	2,33
SK084	Incizija tiroidnog predjela, drenaža, eksploracija, dehisciranje rane		4,39
SK085	Incizija flegmone/karbunkula i/ili hematoma kože ili potkože	Uključuje lokalnu anesteziju	2,55
SK086	Incizija i drenaža dojki		3,01
SK087	Incizija i drenaža apscesa	Ne uključuje bris za mikrobiologiju	3,21
SK088	Ekscizijski debridement mekog tkiva		9,74
SK089	Ekscizija kože i potkože lica		7,66
SK090	Ekscizija kože i potkožnoga tkiva šake i/ili stopala	Uključuje lokalnu anesteziju Ne uključuje PHD	8,05
SK091	Ekscizija kože i potkožnog i mekog tkiva, ostala mjesta, nije drugdje navedeno	Uključuje lokalnu anesteziju Ne uključuje PHD Svaka sljedeća ekscizija može se obračunati 50%	3,62
SK092	Kirurška ekscizija dobroćudnih tumora šake u lokalnoj anesteziji	Uključuje lokalnu anesteziju, šivanje i previjanje	3,74
SK093	Ekscizija pigmentirane promjene ili novotvorine kože i/ili potkožnog tkiva, nije drugdje navedeno	Uključuje orijentacijski pregled, lokalnu anesteziju i previjanje Svaka sljedeća ekscizija može se obračunati 50%.	3,62
SK094	Ekscizija sluznice	Uključuje lokalnu anesteziju	10,45
SK095	Ekscizije u području vanjskog uha	Uključuje lokalnu anesteziju	9,96
SK096	Ekscizija karunkula	Uključuje lokalnu anesteziju	3,01

Tablica 2. Popis dijagnostičko-terapijskih postupaka (DTP) jednodnevne kirurgije.

Šifra DTP-a	Naziv DTP-a	Opis DTP-a	Koeficijent
JK001	Postupci zbog strabizma	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	62,04
JK004	Operacija katarakte	Uključuje trošak multifokalne leće, premium leće (multifokalna torična leća, akomodativna i fakična leća)	53,26
JK005	Tonzilektomija i/ili adenoidektomija	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	50,49
JK006	Miringotomija s umetanjem cjevčice	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	43,28
JK007	Operativni ispravak klempavih uški	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	70,67
JK008	Operacija karpalnog kanala	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	28,85
JK009	Operacija Dupuytrenove kontrakture	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	85,12
JK010	Odstranjenje unutarnjeg fiksatora ili koštanog implantata	Uključuje troškove svih dijagnostičkih i terapijskih postupaka,materijala i lijekova	60,00
JK011	Artroskopija	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	56,27
JK016	Operacija ingvinalne/femoralne/ umbilikalne hernije	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	77,91
JK018	Laparoskopska kolecistektomija	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	142,83
JK019	Postavljanje ligature na venu (stripping)	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	62,04
JK020	Hemoroidektomija / Ekscizija pilonidalne ciste	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	63,48
JK021	Ligatura hemoroidalnih arterija	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	128,37
JK022	Ekscizija analne fistule	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	128,37
JK023	LETZ, postupci na rodnici, grliću maternice i stidnici	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	36,07
JK026	Pobačaj/kiretaža/ histeroskopija	Medicinski indiciran. Uključuje troškove svih dijagnostičkih i terapijskih postupaka	19,23
JK027	Obrezivanje (cirkumcizija) s frenuloplastikom	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	15,87
JK028	Transuretralna resekcija ili incizija prostate	Uključuje troškove svih dijagnostičkih i terapijskih postupaka	121,50

Tablica 3. HZZO – ugovorene postelje dnevne bolnice opće i dječje kirurgije, Republika Hrvatska, i njihova iskorištenost tijekom jedne godine.

Kalendarska godina	Opća kirurgija, broj postelja	Iskorištenost postelja u danima/%	Dječja kirurgija, broj postelja	Iskorištenost postelja u danima/ %	Radnih dana u godini
2013	148	135/54	10	218/87	250
2014	155	148/59	13	191/76	250
2015	278	N	33	N	251

N – dana 22. 4. 2016. nema javno dostupnih podataka

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HERNIAS, AORTIC SURGERY AND REVIEW OF THE LITERATURE ON INCISIONAL HERNIAS

Kile, kirurgija aorte i pregled literature incizijskih hernija

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Abstract

Objectives: To study the relation of incisional hernias after abdominal aortic surgery and to study the recommendations for prevention of incisional hernias in general.

Methods: An extensive search in Pub-Med was conducted. We used the following MeSH terms; abdominal aortic aneurysm; incisional hernia; inguinal hernia; incisional hernia and radiology, abdominal wound closure, we also did a "snow-falling" search with the above terms.

Results: Still today there is no unanimity concerning the relation of aortic or aortoiliac pathology and incisional or inguinal hernias although the majority of studies suggest that there is a possible increase in the prevalence of incisional hernias after aortic surgery.

Conclusions: In order to lessen the possibilities of incisional hernias suture length to wound length ration should be more that 4:1. Sutures should be tied without excessive tension and either a slowly absorbable or nonabsorbable suture material should be used. Use a suture USP 2/0 mounted on a small needle. Place stitches in the aponeurosis only and 5 to 8 mm from the wound edge and 4 to 5 mm apart.

Key words

incisional hernia, aortic surgery, recommendations, abdominal wound suture, prevention of incisional hernias

Sažetak

Ciljevi: Ispitivanje veze između incizijske hernije i operacije abdominalne aorte te općenito proučiti preporuke za prevenciju incizijske hernije.

Metode: Provedena je opsežna potraga u Pub-Medu. Koristili smo sljedeće MeSH uvjete; aneurizma abdominalne aorte; incizijska hernija; ingvinalna hernija; incizijska hernija i radiologija, zatvaranje abdominalnih rana, također je korištena „snow-falling" potraga s navedenim ključnim riječima.

Rezultati: Do danas ne postoji jednoglasnost u pogledu odnosa aorte i aortoilijačne patologije te incizijske ili ingvinalne hernije, iako većina studija ukazuje na to da je moguće povećanje učestalosti incizijske hernije nakon operacije na aorti.

Zaključak: Kako bismo smanjili mogućnost pojave incizijske hernije, dužina šava u odnosu na dužinu rane morala bi biti više od 4:1. Šavove treba vezati bez pretjeranog zatezivanja te za šivanje treba koristiti materijal koji upija sporo ili ne upija uopće. Koristite šav USP 2/0 na maloj igli. Kao mjesto uboda odaberite aponeurozu samo 5 do 8 mm od ruba rane, u razmaku 4 do 5 mm.

Ključne riječi

incizijska hernija, kirurgija aorte, preporuke, šav abdominalne rane, prevencija incizijske hernije

Acronyms:

AAA= Abdominal Aortic Aneurysm, AWHs=Abdominal Wall Hernias, VIHs= ventral incisional hernias, AOD= Aortic Occlusive Disease, ASA= American Society of Anaesthesiology, BMI= Body Mass Index, MAIH= Midline Abdominal Wall Incisional Hernia, SL= Suture Length, WL= Wound Length, AIOD= Aortoiliac occlusive disease, SPE= Surgeon's Physical Examination.

Introduction

The first modern classification of IHs that we found was that of Hall KA et al. [1], who in their study, define two distinct types of VIH that they identified. Focal defects, adjacent to the umbilicus, were present in only five patients (out of 41 with hernia) and diffuse bulging in the remainder. The less frequent, focal periumbilical

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defects appeared to be the result of poor technique when using a running closure. The diffuse defects, manifest by attenuation of the intervening fascia and displacement of the rectus muscles, are more difficult to prevent and more likely to recur. Most patients, however, presented with a diffuse bulging of the abdominal wall extending from the xiphistemum to the umbilicus. Discomfort localized to the region of the hernia was the most common presenting symptom [1].

The current classification for hernias is the classification adopted by the European Hernia Society [2] (EHS). Several members of the EHS board and some invitees gathered for two days to discuss the development of an EHS classification for primary and incisional abdominal wall hernias.

As far as the definition of an incisional hernia (IH) is concerned, they decided to use the definition proposed by Korenkov M et al. [3]: "Any abdominal wall gap with or without a bulge in the area of a postoperative scar perceptible or palpable by clinical examination or imaging" [2, 4].

Traditionally, this clinical examination includes abdominal wall inspection and palpation with the patient supine and standing, as well as during "Valsalva" maneuvers. The examiner looks for a bulge and, if a hernia is believed to be present, the examiner attempts to define the fascial edges. In cases where the fascial defect is small and/or the patient obese, hernias can be missed on physical examination [4].

IHs following laparotomy, irrelevant of pathology, is one of the most frequent long-term complications, affecting up to 20% of unselected patients and up to 50% of high-risk (e. g. obese) patients [5–7].

Risk factors are male sex, smoking, postoperative wound complications, obesity, advanced age, postoperative pulmonary complications, jaundice, abdominal distension, emergency operation, reuse of a previous incision, pregnancy, postoperative chemotherapy, steroids, malnutrition, ascites and peritoneal dialysis [8–10]. Most of these risk factors are associated with excessive strain on the incision or poor wound healing [8].

Wound infection is the most important risk factor, with hernias four times more likely to occur after wound infection [8, 11]. Eight to 29% of the IHs are asymptomatic and, therefore, remain unaccounted for, if the patient is not examined physically [12–14].

Lord RSA et al. [15] found a relation between high blood loss at operation and subsequent hernia formation. This was not confirmed by other studies [16–18].

Prevalence of incisional hernias after aortic surgery

Incisional hernias are reported to be more common in patients with abdominal aortic aneurismal (AAA) disease than in others [19], but the etiologic factors have not been identified [1, 19, 20]. This number may be higher as only <50% of MAIHs occurs within the first postoperative year, whereas 35% develop ≥5 years afterwards [21].

Data on this complication following aortic reconstruction has indicated an overall incidence of 35%, independent of the incision [1, 15–17, 20, 22–28].

Hall K et al. found that patients with AAA have a higher incidence of VIHs and recurrent AWHs without a corresponding increase in patient related risk factors than patients without an aneurysm, suggesting that as yet unidentified etiologic factors may contribute to the development of AWHs in these patients [1].

Henriksen N et al. conducted the first large-scale nationwide study in Denmark. They studied 2597 patients to evaluate the association between aortic reconstructive surgery and the risk of incisional hernia repair in a multivariate model. Risk factors independently associated with incisional hernia repair in their study were AAA repair and BMI ≥25.0 kg/m2[19]. In this study, the cumulative risk of incisional hernia repair was 11% for AAA patients, leading to a 1.6-fold higher risk of incisional hernia repair for AAA patients compared with AOD patients after adjustment for age, ASA score, and BMI [19].

The Danish study is the biggest study in the literature (2597 patients) where the frequency of incisional hernias was presented separately. Most of previous studies were retrospective reviews from selected centers with a maximum of 300 medical files [1, 17, 20, 24, 26, 29].

Three of the studies [27, 30, 31] conducted a prospective follow up of the patients; however, the number of patients was still <300. Furthermore, these studies only included vascular surgeries approaching the aorta through the midline. Two recent meta-analyses assembled the data from these studies and concluded that the risk of developing an incisional hernia after aortic reconstructive surgery through a midline incision was 2.8-fold higher for AAA patients than for AOD patients [25, 32]. However, there was substantial heterogeneity in trial designs, and the overall number of patients was small.

Review studies are divided in two categories, prospective and retrospective. There is a bias in favor of prospective studies. We fully agree with the comment of Jim Chandler, MD (Boulder, Colorado), at the presentation of the study of Hall et al, presented at the 47th Annual Meeting of the Southwestern Surgical Congress, San Antonio, Texas, April 28–26, 1995, saying that "It may sound like heresy, but a retrospective assessment of this particular subject may be less bias vulnerable than a prospective study. We can be confident that these wounds were closed with

equivalent care, since there was no motivation to do otherwise. In the prospective setting, knowledge that the boss has a study underway to test his pet hypothesis that aortic aneurysm patients have a systemic defect making them prone to wound hernias might engender extra care in the wound closures of certain patients. Maybe the wound closures would be more carefully done in aneurysm patients because of their putative hernia proclivity, or more care might be lavished in closing aortoiliac occlusion disease patients to avoid excessive umbrage from having a hernia develop in the "wrong group." So, I like this particular retrospective study" [1].

Liapis CD et al. found that the development of a postoperative incisional hernia after AAA surgical repair had an incidence of 16.2% versus 7.4% after aortofemoral reconstruction. Patients electively operated on for AAA have a 3.8-fold increase of developing a postoperative incisional hernia over patients operated on for peripheral occlusive disease (POD) [30].

Takagi et al. from Japan conducted a systematic review to determine the incidence of postoperative incisional hernia in patients with AAA compared to those with AOD [25]. They concluded that patients with abdominal aortic aneurysm appear to have an approximately 3-fold increased risk for both inguinal and postoperative incisional hernia compared to patients with aortoiliac occlusive disease.

Gruppo M et al. from Italy evaluated the formation of incisional hernia in 1065 patients who underwent elective operations for AAA and AOD using midline incision, they found that both AAA and AOD had a similar incidence of MAIH, which they attributed to wound closure technique. The same was concluded by Hall KA et al. who found that "there was no statistical difference in the incidence of IHs in patients with AAA compared to those with AIOD (22% versus 17%, P<0.001)" [1].

Israelsson LA conducted a prospective study of 1023 patients, 85 of these with aneurysmal disease. Wounds were continuously closed and the suture technique was monitored by the suture length to wound length ratio and they studied the rate of incisional hernia at 12 months [33]. Contrary to the previous studies they concluded that "the rate of incisional hernia is similar in patients with abdominal aortic aneurysmal disease and others".

They attributed the fact that other studies had different results to the fact that patients with aneurysmal disease were less often sutured with a ratio of four or more than others and went on commending that "The higher hernia rate in patients with aneurysmal disease reported in previous studies was thus not confirmed in this study and there was no indication of an inherent defect in wound healing in these patients [33].

Prevalence of inguinal hernia after aortic surgery

In 1984, Cannon and colleagues suggested an association between abdominal aortic aneurysm (AAA) and inguinal hernia [34]. Systemic proteolytic activity degrading connective tissues was proposed as a common etiological factor [35]. It was also suggested that men with an inguinal hernia could be a target for selective AAA screening [36, 37].

Antoniou GA et al. conducted a study and found that, in their institution, male patients with inguinal hernia have a 4-fold increased prevalence of AAAs compared with control subjects without hernias [38].

Patients with AAA have a greater propensity for history of abdominal wall hernia, especially inguinal hernia. The reported incidence of inguinal hernia varies between 19% and 41% in patients with aneurysm disease, compared with 5% to 20% in patients with aortic occlusive disease [1, 26, 27, 34, 39].

Golledge JR et al. [40] evaluated inguinal hernia prevalence in a large cohort of 12 203 men enrolled in an AAA screening program. They found a significantly higher prevalence of (inguinal) hernia in patients with an AAA (266 of 873, 30.5%) than in patients without an AAA (2883 of 10 872, 26.5%) (P = 0.01).

Takagi et al. [25] in their study, examined five studies which reported the incidence of inguinal hernia in aortic disease [1, 26, 27, 29, 31]. Three studies [27, 29, 31] demonstrated a statistically significant increased risk of inguinal hernia in patients with AAA. Pooled analysis of the five studies [1, 26, 27, 29, 31] (representing 787 patients) demonstrated that patients with AAA had a 2.9-fold increased risk of inguinal hernia relative to patients with AOD (25.6% versus 11.9%, OR 2.85, 95% CI 1.71-4.77, p < 0.0001). There was no heterogeneity of results (p = 0.2254) nor publication bias (p = 0.3272). In sensitivity analyses, exclusion of any single study from the analysis did not substantively alter the overall result of our analysis [25].

In a recent study from Denmark, Henriksen NA et al. [19] conducted a research to test the hypothesis of an association between inguinal hernia and AAA in male patients. The aim was to compare the diagnosis of inguinal hernia and the presence of an AAA in a large population-based cohort undergoing systematic screening for AAA by ultrasonography. The cohort comprised men participating in AAA screening in the Central Region of Denmark from 2008 to 2010 (the VIVA trial) [41]. A total of 25 000 people were randomized to screening and 75% attended [41, 42]. All participants had ultrasonography and their aortic diameter was measured. Data on age, body mass index (BMI), smoking status, hypertension, diabetes and family history of AAA were also recorded.

They concluded that "in contrast to smaller patient-

based studies, this large population-based study found no association between inguinal hernia and AAA [19]".

Natural history of incisional hernias

The majority of significant incisional hernias develop in the two years following surgery [43], although the incidence increases with length of review such that 35% appear 5–10 years following surgery [21]. Late incisional hernia formation may result from inadequate suture length or the 'sawing' action of non-absorbable suture material on the abdominal wall [44].

Type of incision

The incidence of incisional hernia after abdominal aortic surgery repair is influenced by the type of incision. It is lower in patients who had a transverse incision [16]. The incidence of IHs in AAA repair does not differ between a transperitoneal or retroperitoneal approach in aortic surgery [45, 46].

The size of the hernia was an independent risk factor for recurrence in two retrospective studies, in which "approximating" (edge-to-edge) fascial repairs [47, 48] and "overlapping" repairs [49] were evaluated, but not in another study [50].

Among patients with midline abdominal incisional hernias, mesh repair is superior to suture repair with regard to the recurrence of hernia, regardless of the size of the hernia [28].

Recurrence rates after primary repair of IHs are reported from 30% to 50% [1]; Sitzmann JV and McFadden DW [51] have reported a 2.5% recurrence rate in patients using internal retention sutures. Even after mesh repair of incisional hernia, there is a further recurrence rate of up to 50% [1, 28, 52].

Kind of sutures

It is recommended that the suture material must contribute to the strength of the wound during a sufficiently long period and, as the aponeurosis heals rather slowly, it needs support of the suture for at least 6 weeks [53]. It is advocated that to decrease the risk of incisional hernia formation, the fascia should be closed with slowly absorbable (total resorption >180 days) or non-absorbable sutures and with a suture length at least four-times greater than the wound length [6, 33, 54].

Experimentally, fascial wounds reach their maximum tensile strength at 200 to 300 days compared to 14 to 21 days for skin [55, 56]. Therefore, sutures of appropriate durability and tensile strength should be selected when closing these wounds [57].

Although Hall KA et al. in the early part of their study [1], they used braided absorbable suture (Dexon and Vicryl), they claim that "it appears unlikely that the type of suture material alone was a major contributing factor" [1]. Both braided absorbable and monofilament nonabsorbable sutures have been shown to be equally efficacious in closing midline incisions in prospective studies [58]. Furthermore, the incidence of VIH has remained unchanged despite the use of nonabsorbable monofilament suture [1].

At present, polydioxanone is the only slowly absorbable monofilament suture material that has been evaluated in comparison with a nonabsorbable suture – a randomized trial also monitoring the quality of the suture technique [59].

Furthermore, the use of long-lasting absorbable suture material compared with nonabsorbable suture material decreases postoperative pain and wound infection [18, 60–62].

For a continuous suture line either single thread or loop sutures can be applied [63, 64]. With the latter two loops are probably often used in long wounds, starting one at each end and tying them together in the middle [33].

Suture technique

There was a debate regarding the use of single or layered closure of abdominal wall incisions. In experimental animals, fascial wounds closed in a single layer have less tensile strength at 8 days than those closed in 2 layers; however, this difference was no longer apparent once the wounds were fully healed [56].

Now it is recommended to close the abdominal wound by "a single layer aponeurotic closure technique without separate closure of the peritoneum" [2].

Although mass suturing of the musculoaponeurotic layers of the abdominal wall is associated with a low incidence of wound dehiscence, the incidence of late incisional hernias remains at about 10% [65, 66].

It is commonly believed that the tension used to approximate the layers of the abdominal wall, using the mass closure technique, may cause mechanical or ischemic injury to the tissues contributing to the development of AWHs [1].

In the study of Hall KA et al. they advocate that "primary repair with interrupted nonabsorbable monofilament suture may be appropriate in patients with small defects. Although none of the periumbilical defects closed using this technique in their study have recurred, recurrence rates of 2% to 10% have been reported" [20].

Although some larger defects may be closed primarily using fascial release incisions as in the Keel repair, prosthetic material such as Marlex mesh or PTFE is usually necessary to reinforce defects too large for primary closure [66–70].

Jenkins was the first to define an ideal ratio on the basis of both clinical trials and a mathematical model, recommending that an SL:WL ratio of at least 4:1 is

necessary for a safe laparotomy closure [71].

Israelsson LA and Millbourn D state in their study 72] that "the quality of the suture technique is easily monitored through the SL to WL ratio, which correlates strongly with the subsequent rate of incisional hernia" [73–75].

A low rate of incisional hernia is achieved when the SL to WL ratio is four or more [73], and with a lower ratio the rate of incisional hernia is four times higher [74–76]. Suturing with a high SL to WL ratio prolongs the operation by a few minutes, but is cost effective because the expense of subsequent incisional hernias is lower [77].

Use of mesh

Despite an optimal closing technique, incisional hernias still develop in a number of patients. The use of prophylactic meshes inserted during primary laparotomy to avoid subsequent incisional hernia formation has been evaluated in high-risk groups such as patients undergoing bariatric surgery, stoma formation, and high-risk gastrointestinal surgery [78–80]. A recent randomized controlled trial evaluated the use of prophylactic mesh insertion vs. sutured fascial closure with nonabsorbable suture in a 4:1 ratio in 85 patients undergoing open elective AAA repair [81]. The incisional hernia rate was significantly decreased in the mesh group, with no increase in the wound infection rate [81].

In a recent study from Greece, Bali C et al. [82], in a prospective randomized clinical study, patients electively treated by open AAA repair were allocated equally to routine abdominal suture closure or to prophylactic placement of bovine pericardium mesh above the fascia. The study end points were: postoperative complications and incidence of incisional hernia at a 3-year follow up. Cumulative proportion of freedom from incisional hernia was 100% for mesh group at 3 years and 74.4% (SE 9.9 %) for control group at 2 years ($p < 0.008$). They concluded that the bovine pericardium mesh reinforcement of fascia closure in patients undergoing open AAA repair showed effectiveness and low complication rate in prophylaxis from incisional herniation. It should be considered as an alternative mesh material in selected patients [82].

O'Hare JL et al. examined the outcome after prophylactic placement of a pre-peritoneal poly-propylene mesh during abdominal closure in consecutive patients having elective AAA repair. At least 30 months after surgery, 28 patients underwent clinical and ultrasound examination of their surgical wound for incisional hernias. Only one patient had a hernia in the original surgical scar. No patients had late mesh-related wound problems. They concluded that pre-peritoneal polypropylene mesh placement is a simple, safe and effective method to decrease the incidence of incisional hernia after AAA repair [83]. Similar results were published by Rogers M et al. [84] and they stressed that it is important that mesh is not used unless a satisfactory peritoneal layer can be developed to prevent adherence to small intestine with the risk of fistulation.

Size and distance of suture's bites

Another field of debate concerning closure of abdominal incisions is the bite size and distance between bites.

Cambell JA et al. in their study "A biomechanical study of suture pullout in linea alba" pointed out that: Optimum security was obtained with bites of at least 1.2 to 1.5cm [85].

In another study, it is advocated that "When closing midline wounds, we take bites approximately 2 cm from the edge of the fascia and 1 cm apart" [1].

One of the commentators in this presentation, Arlo Hermeck, noticed that, often our residents, when making a midline abdominal incision, fail to clean off the fat from the fascia. When these wounds are re-approximated, a fat-to-fat closure results instead of fascia-to-fascia. I've always felt, without any data for support, that this increased the incidence of midline incisional hernias, and I would like your comment on this matter". The presentator replied with "I agree fully. I believe that you need to dissect the skin and subcutaneous tissue off the fascia, especially in obese patients, so that the fascial margins can be clearly defined" [1].

In the addition to the above, Islraelsson JA et al. in a recent study [72], advise that the treatment of dehiscence of abdominal wound should be done by "Placing stitches in strong suture-holding tissue thus implies that sutures are placed at a fairly large distance from the wound edge, and often a distance of 3 cm is necessary" [72]. This implies that placing the suture at distance more than 1 cm from edges is more secure.

Hogstrom H et al. [86], in their study "Suture technique and early breaking strength of intestinal anastomoses and laparotomy wounds", concluded that; "The breaking strength of the sutured fascia, but not that of the colon, was higher when sutures were inserted at the longer distance from the wound edges" [86].

Contrary to the above, Milbourn D in his doctoral research found that; "in midline abdominal incisions closed with a continuous single-layer technique the rate of Surgical Site Infections (SSI) and IH is lower with small stitches than with large [87].

In another randomized trial including 737 patients, the effect on the rate of incisional hernia was studied with small stitches in comparison with large stitches. Closure with small stitches was made with a polydioxanone suture USP 2/0 mounted on a needle so small that

stitches could not be placed more than 5 to 8 mm from the wound edge, only incorporating the aponeurosis. The rate of incisional hernia was 5.6% with small stitches, and was three times higher with large stitches placed more than 10 mm from the wound edge [74]. Closing wounds with many small stitches at close intervals prolonged each operation by about four minutes, but was cost effective owing to the reduced cost for subsequent hernia repairs [74, 87]. The STITCH trial confirmed the above [88].

Suture tension

The next problem with the suture technique is the suture tension.

Mayer et al. [65] have reported a 10% incidence of incisional hernias in wounds closed under normal tension compared to 5.5% in wounds tightly sutured, suggesting that some tension may be necessary for primary healing.

Contrary to the above, Israelsson LA and Millbourn D [72] in their study state that "The tensile strength is higher in wounds approximated with low tension than in wounds closed with high tension". This was confirmed by other studies [72, 89–91].

Radiology

Until the advent of high-quality CT, a surgeon's physical examination (SPE) was the primary modality used for diagnosis of incisional hernias [4].

The clinical diagnosis of an incisional hernia is often difficult, especially in obese patients, those with significant abdominal pain, or those in whom the hernia has dissected along muscle layers [92]. However, plain radiography, radiography performed after administration of barium, and computed tomography allow evaluation of suspected abdominal hernias and detection of those that are clinically occult. The anatomic location of the hernia, the contents, and complications such as incarceration, bowel obstruction, volvulus, and strangulation can be demonstrated with radiologic examination [92].

Musella M et al. [27] showed that ultrasonographic evaluation is unreliable in the early detection of abdominal wall hernia, supporting previous studies showing that approximately a half of the patients with abdominal wall hernia less than 5 cm are missed by this technique [93]. In their report, MRI was useful in early diagnosis of abdominal wall hernia, even those of small dimensions [27]. Although the efficacy of ultrasound in diagnosing abdominal wall defects is advocated [94], only CT provides findings comparable to those of MRI [95].

In another study, Beck WC et al. has demonstrated the use of ultrasound to detect incisional hernia formation using dynamic abdominal sonography for hernia with results comparable with CT [96]. Real-time sonography demonstrates bowel peristalsis and acoustic shadowing by bowel loops in the abdominal wall [92].

A few small studies from Greece and Spain evaluating the use of CT as a follow up after incisional hernia repair have found that CT has a sensitivity of 100% and specificity of 97% for detection of recurrence [97, 98]. However, due to the relatively high cost and the exposure to ionizing radiation, CT is not widely used in follow up after hernia repair, particularly if the patient is asymptomatic [4].

Most incisional hernias are easily recognized by careful inspection and palpation. However, there are several situations whereby an accurate clinical diagnosis may be difficult or impossible [99].

Radiography performed with orally administered barium and frequent fluoroscopic inspection is useful in detecting incisional hernias [92]. Areas of surgical scarring should be imaged in profile during performance of the Valsalva maneuver. CT shows the abdominal wall defects and the hernial contents, as well as signs of bowel ischemia. Enteroclysis may be necessary to diagnose small, occult hernias [92].

Gary G. Ghahremani et al. [99] studied the CT of the abdomen of 14 adult patients 2–25 months after laparotomy in order to evaluate intra-abdominal processes. Clinically unsuspected incisional hernias were detected in all cases. These herniations were not disclosed by a previous physical examination because of the patients' obesity, abdominal pain, distension, or various other factors. However, CT scans showed the exact size, location, and content of each incisional hernia [99].

Baucom RB et al. [4] evaluated the accuracy of SPE for detection of incisional hernias compared with CT. They enrolled 181 patients (mean age 54 years, 68% female). Hernia prevalence was 55%. Mean area of hernias was 44.6 cm2. Surgeon physical examination had a low sensitivity (77%) and negative predictive value (77%). This difference was more pronounced in obese patients, with sensitivity of 73% and negative predictive value 69% [4].

They concluded that "surgeon physical examination is inferior to CT for detection of incisional hernia, and fails to detect approximately 23% of hernias. In obese patients, 31% of hernias are missed by surgeon physical examination[4]. This has important implications for clinical follow up and design of studies evaluating hernia recurrence, as ascertainment of this result must be reliable and accurate" [4]. This was confirmed by Rodriguez HE et al. [100] they concluded that radiographic evaluation is more sensitive than clinical observation for detection of ventral hernias. Clinical events and reinterventions related to these radiographic abnormalities are rare. CT was diagnostic modality that helped as diagnosing the hernia [100].

Conclusions

Despite the fact that some studies dispute any relation, the majority of studies indicate a higher prevalence between aortic and aortoiliac pathology and incisional and inguinal hernias.

In order to minimize the rate of IHs after a midline incision [72] we must:

1. Use a slowly absorbable or nonabsorbable suture material.
2. Use a suture USP 2/0 mounted on a small needle.
3. Place stitches: In the aponeurosis only,
4. 5 to 8 mm from the wound edge,
5. 4 to 5 mm apart.
6. Measure the wound length and the suture remnants for calculation of the SL to WL ratio.
7. Document the SL to WL ratio.
8. Do not accept closure with an SL to WL ratio lower than 4 [72].
9. Polydioxanone is the only slowly absorbable suture approved for suturing midline abdominal wounds [59].
10. We can use either a single thread or loop sutures [63, 64].
11. It is suggested that men with an inguinal hernia could be a target for selective AAA screening [36, 37].

Declaration of interest:

The authors declare that there is no conflict of interest that could be perceived as prejudicing the impartiality of the research reported.

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CONGESTIVE HEART FAILURE AND LOWER EXTREMITY EDEMA AS LATE SEQUELAE OF UNRECOGNIZED ILIAC ARTERIOVENOUS FISTULA

Kongestivno zatajenje srca i edem donjeg ekstremiteta kao kasni nastavak neprepoznate ilijačne arteriovenske fistule

Mladen Petrunić[1], Tomislav Meštrović[1], Yvonne Lončarić[2], Josip Figl[1]

Abstract

We report a case of a female patient with a large volume iliac arteriovenous fistula. She presented with severe congestive heart failure and unilateral leg edema. Six years before present admission she underwent surgery because of the lumbar disc protrusion. Diagnosis was delayed due to the overshadowing symptoms of co-existent aortic valve insufficiency. Contrast-enhanced multislice computed tomography with three-dimensional reconstruction confirmed the diagnosis. The fistula was closed by using an open surgical approach, and the patient completely recovered. Severe late consequences of unrecognized arteriovenous fistula are emphasized. Causes for delayed recognition of underlying pathology, as well as diagnostic and treatment options are discussed.

Key words

aortocaval and iliac, arteriovenous fistula, congestive heart failure, leg edema, spinal surgery

Sažetak

Prikazujemo slučaj bolesnice s visokoprotočnom ilijačnom arterijsko-venskom fistulom. Bolesnica se prezentirala teškim kongestivnim zatajenjem srca i unilateralnim edemom noge. Šest godina prije sadašnjeg prijema, bolesnica je operirana zbog protruzije lumbalnog intervertebralnog diska. Dijagnoza arterijsko-venske fistule je postavljena kasno, zbog prikrivenosti tegoba pridruženom insuficijencijom aortalnog zaliska, a potvrđena je spiralnom kompjutoriziranom tomografijom s kontrastom i trodimenzionalnom rekonstrukcijom. Fistula je zatvorena otvorenim kirurškim pristupom. Bolesnica se potpuno oporavila nakon operacije. U ovom prikazu ističemo teške kasne posljedice neprepoznate arterijsko-venske fistule i razmatramo uzroke kasnog postavljanja dijagnoze, kao i različite mogućnosti dijagnostike i liječenja.

Ključne riječi

aortokavalna i ilijačna, arterijsko-venska fistula, srčana dekompenzacija, edem noge, spinalna kirurgija

Introduction

Iliac arteriovenous fistulas (AVF) are rare and even less frequently reported than aortocaval fistulas [1, 2]. The most common etiological factors include rupture of the iliac artery aneurysm into the adjacent vein, followed by penetrating trauma and iatrogenic causes like lumbar surgery [1–4]. Typical clinical features include lumbar pain, high cardiac output, unilateral lower extremity edema, leg ischemia or intermittent claudication and a machinery-like bruit. A palpable thrill over the fistula site is usually present [1, 5]. If diagnosis is delayed, severe late complications like heart failure, renal and hepatic insufficiency may occur [1, 6–9]. Therefore, early diagnosis and treatment are mandatory. Different noninvasive as well as invasive diagnostic procedures are used, but precise delineation of the fistula site is the goal of utmost importance. Treatment modalities depend on the patient's and local AVF characteristics. Successful endovascular as well as open repairs have been reported.

Case report

A 57-year-old woman was referred due to the progression of exertional dyspnea, left leg edema and lumbar pain. Six years before present admission she underwent surgery because of disc protrusion at the

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L4-L5 level. Two years after lumbar surgery she underwent coronarography because of chest pain and suspected coronary artery disease (CAD). While the diagnosis of CAD was not confirmed, the diagnosis of the mild aortic valve stenosis (AVS) was established and the patient has been followed by a cardiologist ever since. Physical examination at present admission revealed distended superficial neck and abdominal veins, a massive thrill on abdominal palpation and a continuous machinery-like bruit over the lower abdominal wall. Apart from the left leg edema, the calf skin induration and hyperpigmentation were also present (Fig. 1). Chest X-ray showed cardiomegaly and increased pulmonary vascular markings (Fig. 2). Echocardiography showed hyperdynamic motion of the left ventricular (LV) wall and aortic valve stenosis, with a systolic gradient of 58 mmHg. Elevated total bilirubin (43 µmol/L) and gamma-glutamyltransferase (96 U/L) indicated liver stasis. Multislice computed angiography (MSCTA) with a three-dimensional (3D) reconstruction demonstrated a high-flow AVF of 11 mm in diameter between the right common iliac artery and the left common iliac vein. The inferior vena cava (IVC) was dilated to 55 mm and both common iliac veins were also dilated. The right common iliac artery was enlarged with the maximum transverse diameter of 18.8 mm (Fig. 3). Hepatic veins and pulmonary arteries were also dilated. Due to the progression of severe symptoms, we decided to intervene immediately. Because of the hemodynamic characteristics of the AVF, local anatomy and patient's condition, we decided to perform an open surgery. Full invasive monitoring was established and a cell-saver device was obtained. Preoperative hemodynamic parameters were: cardiac output (CO) 13.2 L/min; cardiac index (CI) 7.5 L/min/m2; stroke volume (SV) 212.9 ml/beat, mean pulmonary artery pressure (PAP) 47 mmHg; and pulmonary artery occlusion pressure (PAOP) 17 mmHg. Midlaparotomy was performed. The AVF was located between the proximal portion of the right common iliac artery and the left common iliac vein. The arterial and venous walls were tightly approximated with dense fibrotic tissue in between, so we decided not to separate the vascular structures. Thorough exploration of the abdominal cavity was performed as to reveal any additional pathology. Heparin was administered and we clamped the aorta and the distal common iliac arteries away from the neighboring dilated veins. The inferior vena cava and the common iliac veins were also clamped. The common iliac artery was opened longitudinally, the fistula identified and closed with a continuous 4-0 prolene suture. The suture line was reinforced with Teflon pledgets. The arterial wall was extremely friable and we decided to perform an arterial reconstruction with "Y" Dacron silver graft (16x8 mm). The proximal anastomosis was created at the level of the infrarenal aorta, while the distal anastomoses were performed at the level of the distal common iliac arteries. The immediate postoperative values of the hemodynamic parameters improved: CO was 5 L/min, CI 2.9 L/min, SV 94.3 ml/beat, mean PAP 20 mmHg and PAOP 35 mmHg. The leg edema rapidly decreased within several days and the patient was released from the hospital on the 12th postoperative day. During the eight-month follow-up period, her cardiac and liver function significantly improved and she regained complete walking ability.

Discussion

Clinical manifestations of an aortocaval and iliac AVF may comprise a wide array of symptoms. In the majority of reported cases, aortocaval fistulas resulted from an aortic aneurysm rupture. Such patients have usually had an acute presentation due to the large volume of shunting blood followed by cardiac overload. Most patients with a large volume arteriovenous fistula manifest progressive dyspnea on exertion, an abdominal bruit and lower back pain. Because of the large shunting volume of the AVF, high-output cardiac failure may occur. Dilatation of the inferior vena cava and iliac veins as well as lower extremity edema are often associated [1, 5, 6, 10]. Liver and renal failure have been reported as a consequence of the acutely emerging aortocaval AVF [1, 3 ,6–9]. Apart from an acute presentation of the large volume AVF, in some cases the symptoms may arise gradually over time, due to the progressive fistula enlargement. Such clinical situations may emerge after vascular lesions during lumbar disc surgery, if the initial bleeding is overlooked. In those patients, the diagnosis of AVF may be delayed. In a review written by Brewster et al., the interval from the presumed occurrence of vascular lesion to the established diagnosis of AVF ranged from several hours to eight years. The authors reported that the most prominent symptoms of AVF were back pain (70%) and abdominal bruit (80%). Severe leg edema was the primary manifestation in eight out of 20 cases, while congestive heart failure occurred in only seven (35%) patients. Four AVFs resulted from a previous lumbar surgery [1]. The first AVF as the sequel of lumbar surgery was reported by Linton and White in 1945 [11] and more cases were reported afterwards. Vascular lesions during lumbar surgery usually occur during instrumentation of the disc space at the levels L4-L5 and L5-S1 [4, 11–13]. The vessels at this level are particularly vulnerable to injury because of their relative immobility and proximity to the spine when the patient is in prone position. In our patient, the AVF occurred at the level of L4-L5 vertebrae, corresponding precisely with the site of the previous lumbar surgery. The location of the AVF and the patient's history led us to presume that the initial vascular lesion had resulted from a lumbar disc surgery six years before present admission. Sometimes, the existing symptoms of AVF

may be misinterpreted or overshadowed by symptoms of an associated pathology. In the report of a patient with multiple organ failure secondary to iliac aneurysm rupture into the adjacent vein, the diagnosis was delayed as the multi-organ derangement was attributed to sepsis [6]. Another case report was related to a 71-year-old woman treated for unilateral leg edema. Because of the symptoms progression, an additional diagnostic evaluation had been performed that revealed an aortocaval fistula. The diagnosis was missed in the early phase of the disease primarily because of the low shunting volume through the AVF [5]. In our patient, the aortic valve stenosis certainly overshadowed the existing symptoms of the AVF. In order to avoid severe late complications, early diagnosis and treatment of AVF are essential. Over years, conventional angiography was most commonly used to define the diagnosis of AVF. Introducing the spiral and multislice computed tomography, the evaluation of a suspected aortocaval and iliac AVF is possible using MSCT angiography [3]. Gadolinium-enhanced magnetic resonance angiography has recently been introduced as a precise diagnostic method while avoiding iodinated contrast agents [13]. Using contrast enhanced MSCT angiography in our patient, early synchronous and equivalent enhancement of the iliac veins, inferior caval vein and aorta was demonstrated, thus indicating the presence of the AVF. The precise location of the fistula, as well as clear visualization of all surrounding structures, was demonstrated after 3D reconstruction. Although rare, the majority of literature data have reported on open surgery for patients with AVF that manifested the signs of acute or progressive deterioration [1, 3, 9, 10]. Open surgery in such patients is often associated with massive bleeding and with significant hemodynamic disturbances. However, if anatomic features and the patients condition are favorable, endovascular treatment may be the first line therapeutic option [2, 12, 13]. In our patient, the diameter of the AVF was large and the degree of shunting was enormous. The inflow iliac artery was enlarged to the aortic bifurcation. The patient also exhibited severe progressive deterioration. Taking all above into consideration, we decided to perform an open surgery without any delay. With an open approach we achieved complete intraoperative control of all involved vascular structures. Clamping the adjacent arteries and veins proximal and distal to the fistula site provided a bloodless operative field and a precise fistula closure, without the need to hurry. Due to chronic inflammatory and adhesive changes of the tissue surrounding the AVF, vascular anastomoses were created within the segments of the normal arterial wall.

Conclusions

An unrecognized AVF may lead to severe life threatening complications. In the presence of an acute large volume AVF, followed by typical symptoms, the diagnosis is usually established early. On some occasions, like lumbar surgery, early symptoms after a vascular lesion may be discrete and such lesions are easily overlooked. In patients who develop cardiac symptoms after lumbar disc surgery, diagnostic work-up for revealing the AVF is mandatory. Special attention has to be given to patients with preexisting cardiac pathology, thus masking the symptoms emerging from the AVF. Anatomic and pathophysiologic characteristics of the fistula as well as the patient's general condition are essential with regard to treatment modality. A less invasive endovascular approach is recommended as the first-line treatment option in appropriate cases. An open surgery should be considered in some unstable patients with complex pathology and in those with an unfavorable anatomy not amenable for endovascular access.

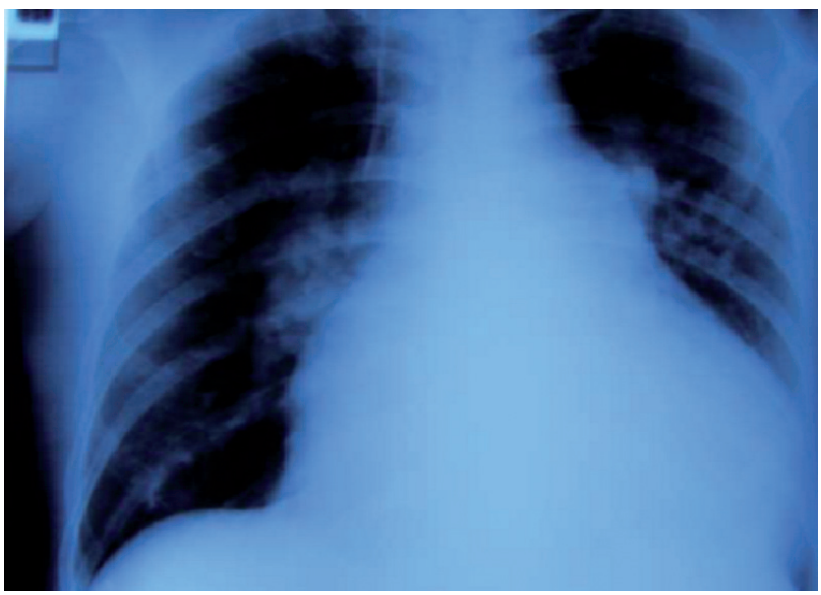

Figure 1. Cardiomegaly and increased pulmonary vascular markings on the preoperative chest X-ray.

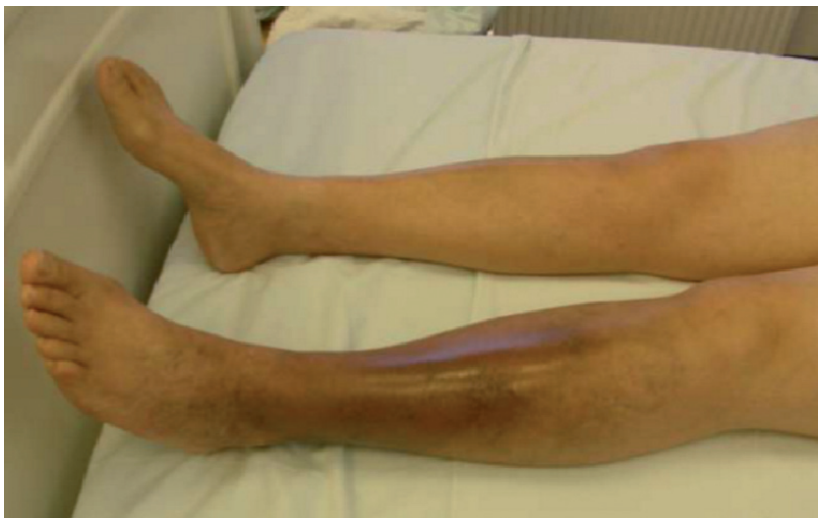

Figure 2. Edema, varicosities and skin discoloration of the patient's left calf.

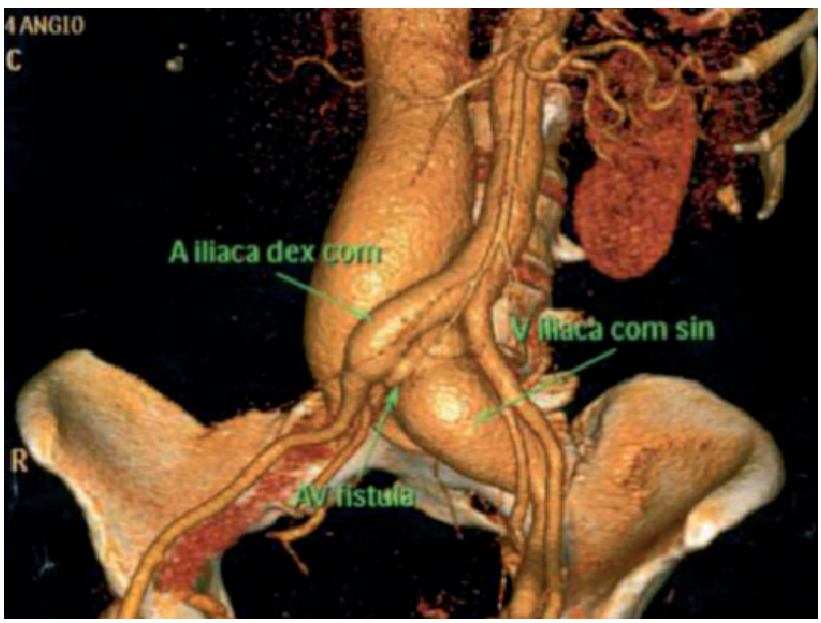

Figure 3. MSCTA with 3D reconstruction, demonstrating arteriovenous fistula between the right common iliac artery ("A iliaca dex com") and left common iliac vein ("V iliaca com sin").

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FAMILIAL CAVERNOUS ANGIOMATOSIS: CASE REPORT OF A FAMILY WITH MULTIPLE INTRACRANIAL LESIONS

Familijarna kavernozna angiomatoza: prikaz obitelji s multiplim intrakranijalnim lezijama

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Abstract

Cavernous angiomas of the brain belong to a group of occult vascular malformations of the central nervous system, i. e. to changes not evident on conventional angiographic examinations. Intraoperatively or at autopsy, they represent raspberry-like clusters of veins. Magnetic resonance (MR) imaging of the brain is the diagnostic method of choice, where cavernomas typically appear as zones of mixed-signal intensity due to the presence of hemosiderin in the surrounding brain parenchyma. Familial form of cavernous angiomatosis is an autosomal dominant disorder which occurs as a result of the mutations in one of the three different genes, and is most often present in the Hyspanic-American population. Familial form of the disease is characterized by the presence of two or more lesions in the brain tissue, in two or more members of the same family. In 2008, three patients in close blood relation were hospitalized within a short period of time at the Neurosurgery Clinic Niš for multiple cavernous angiomas of the brain, as confirmed by MR imaging and a histopathologic finding in one surgically treated family member. Three other family members were subsequently examined and familial cavernous angiomatosis was confirmed in two additional members who were asymptomatic. MR imaging was performed using T1- and T2-weighted SE sequences and T2-weighted GRE sequence. The number of lesions seen in T2 SE (60) and T2 GRE (406) sequences was analyzed, and a discrepancy in the number of found cavernomas was displayed. The number of cavernomas by brain regions, the number of cavernomas in asymptomatic and symptomatic patients as well as their distribution, were also analyzed.

The obtained data show superiority of the T2 GRE sequence over T2 SE sequence in terms of sensitivity. Type IV cavernoma is detected only on T2 GRE images, according to Zabramski. Type IV cavernoma is one of the features of familial cavernous angiomatosis.

Key words

familial cavernous angiomatosis, cavernoma, cavernous angioma, gradient recalled echo

Sažetak

Kavernozni angiomi mozga pripadaju grupi okultnih vaskularnih malformacija središnjeg živčanog sustava, tj. promjenama koje se ne prikazuju na klasičnim angiografskim ispitivanjima. Intraoperativno ili na autopsiji predstavljaju vensko klupko slično malini. Dijagnostička metoda izbora je MR mozga na kojem se kavernomi prikazuju najčešće kao zone mješovitog signala uslijed prisustva hemosiderina u okolnom moždanom parenhimu. Familijarni oblik kavernozne angiomatoze je autosomno-dominantno nasljedni poremećaj, koji se javlja kao posljedica mutacija na jednom od tri različita gena i najčešće je prisutan u hispanoameričkoj populaciji. Karakteristika familijarnog oblika oboljenja je prisustvo dvije ili više lezija u moždanom tkivu, kod dvije ili više osoba iz iste obitelji. Tijekom 2008. na Klinici za neurokirurgiju Niš je u kratkom vremenskom razdoblju hospitalizirano troje pacijenata u bliskom srodstvu kod kojih je dokazano postojanje multiplih kavernoznih angioma mozga realizacijom MR mozga uz patohistološku potvrdu kavernoma kod jednog operiranog bolesnika iz obitelji. Naknadno su ispitane još tri osobe iz obitelji pri čemu je pozitivan nalaz familijarne kavernozne angiomatoze potvrđen kod još dva člana koji su bili asimptomatski.

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MR mozga je realiziran uz upotrebu T1 i T2 SE, kao i T2 GRE sekvence. Analiziran je broj lezija viđenih u T2 SE (60) i T2 GRE (406) sekvencama te je prikazana diskrepancija u nađenom broju kavernoma. Analiziran je broj kavernoma po regijama mozga, broj kavernoma kod asimptomatskih i simptomatskih pacijenata, kao i njihova distribucija.

Dobiveni podaci prikazuju superiornost T2 GRE sekvence u senzitivnosti u odnosu na T2 SE sekvencu. Tip IV kavernoma po Zabramskom detektira se samo na T2 GRE snimkama. Postojanje tipa IV kavernoma je jedna od karakteristika familijarne kavernozne angiomatoze.

Ključne riječi

familijarna kavernozna angiomatoza, kavernom, kavernozni angiom, gradient recalled echo

Introduction

Cavernous angiomas belong to the group of intracranial vascular malformations caused by a disorder in the development of the vascular bed. Macroscopically, they represent a collection of blood vessels resembling a raspberry [1]. They are mostly localized in the brain tissue, but can also be found in the spinal cord, retina or as skin changes [2, 3]. Pathohistologically, these are vascular channels made of walls that are lined with single endothelium, without smooth muscle tissue or elastic fibers, with the absence of brain tissue between the pathological blood vessels of the tangle. The number and size of these pathological channels inside the cavernoma grow throughout life.

Since cavernous angiomas are most often localized in the brain tissue, they can lead to epileptic seizures, focal neurological deficits or a fatal cerebral hemorrhage. Hemosiderin is present even in the absence of apparent hemorrhage in the surrounding parenchyma [4]. A quarter of patients are asymptomatic [5].

Considering that cavernous angiomas are not characterized by significant inflow of blood or significant venous drainage, they belong to occult vascular malformations that are not visible during conventional angiographic procedures. Owing to advances in MR imaging technology, cavernous angiomas are becoming one of the most commonly diagnosed vascular malformations with a prevalence of 0.4–0.9%. Prospective autopsy series have confirmed the incidence of cavernous angiomas from 0.49 to 0.53% [5]. Multiple lesions comprise 15–30% of all cases [6].

Familial cavernous angiomatosis represents an autosomal dominant disorder [7, 8] which is most common among Latino families. It comprises 10–15% of the total number of cavernoma cases [9]. In the familial form of cavernous angiomatosis, multiple lesions are present in 3/4 of patients.

Studies have shown changes on at least three different genes, affecting the occurrence of the familial form: CCM1 and CCM2 genes located on chromosome 7 and CCM3 gene located on chromosome 3, not yet completely analyzed [4, 10].

Objective

Literature review does not indicate that investigations of families with the familial cavernous angiomatosis have been carried out on the territory of Serbia. This is the first time that members of a family with multiple cavernous angiomatosis of the brain have been examined and the results analyzed and presented in a paper. MR imaging with T1 and T2 sequences and T2 GRE (Gradient Recalled Echo) sequences was performed on all of the studied patients. The MR findings in symptomatic and asymptomatic patients, as well as the type and number of lesions, were compared, according to the classification by Zabramski [11]. The number of cavernous changes in various brain regions was analyzed.

Materials and Methods

In 2008, three patients in close blood relation were treated for intracranial hemorrhage at the Department of Neurosurgery, Niš. MR exploration of the intracranium was subsequently conducted on three other members of this family and the MR images made prevously for epileptic equivalents were reviewed with regard to one more person. MR imaging of the brain using T1 and T2 SE sequences, as well as T2 GRE sequences, was performed on all the patients. The MRI equipment used was the Siemens Avanto 1.5T MRI Scanner.

All findings were independently reviewed by two specialists, radiologists and neurosurgeons. T1, T2 and T2 GRE sequences were compared and analysed with regard to the number and type of lesions found during the MR exploration.

Types and numbers of cavernous angioma were processed according to the classification by Zabrimski.

Statistical data were processed in the Statistica 8 soft (StatSoft, Tulsa) program, using the Mann-Whitney U test and Wilcoxon signed-Rank test.

Results

Type I lesions are characterized by subacute hemorrhage in the zone with the present change. On transverse sections, on T1 SE sequence, type I is characterized by the existence of a broad lesion involving a zone of high-signal intensity and a zone of low-signal intensity which indicates a more recent bleeding. T2 SE sequence shows the zone of bleeding more clearly. T2 GRE sequence clearly demarcates the change zone. These data are illustrated in Figures 1, 2 and 3.

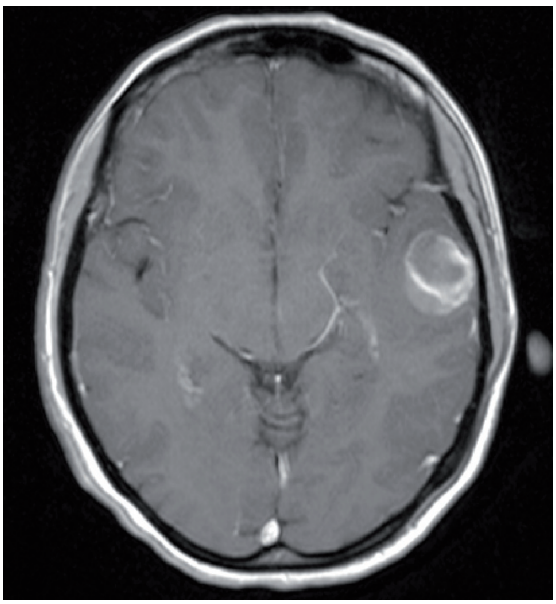


Figure 1. Type I cavernoma revealed in T1-weighted SE sequence.

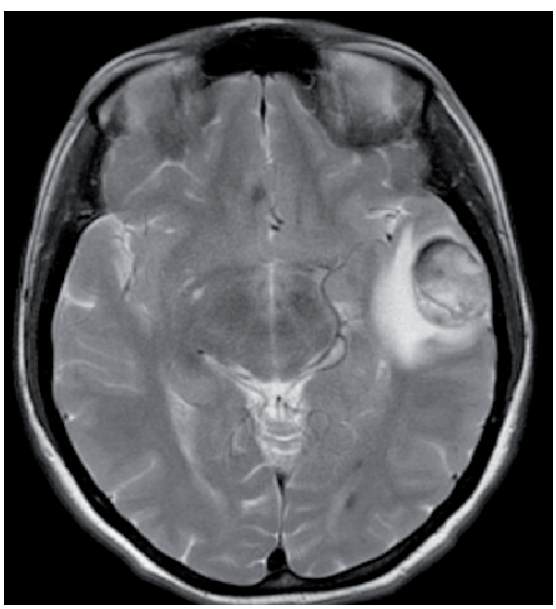


Figure 2. Type I cavernoma revealed in T2-weighted SE sequence.

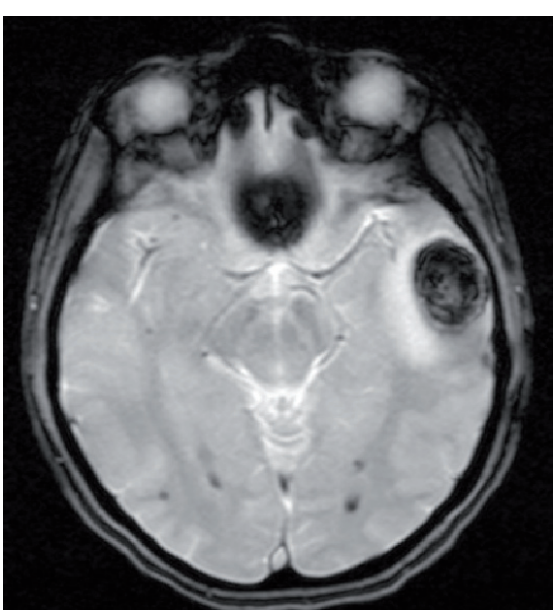
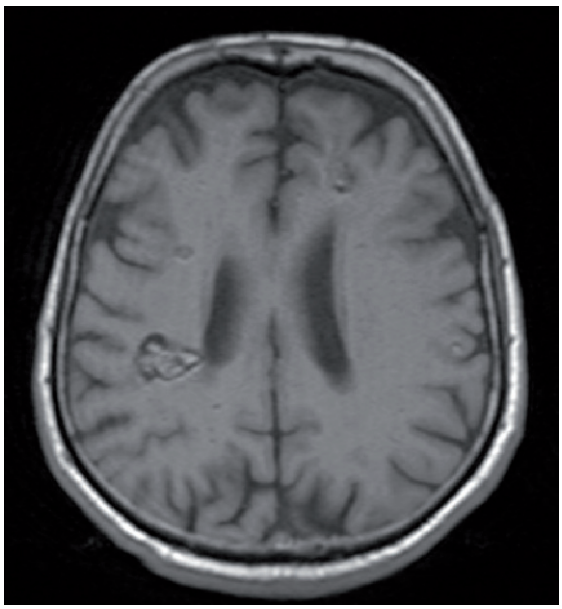


Figure 3. Type I cavernoma revealed in T2 GRE sequence.



Type II is a lesion with bleeding and thrombosis zones in multiple time intervals. It typically appears as most commonly verified, raspberry-like cavernoma of the brain. Type II lesion is shown in Figures 4, 5 and 6 with the central reticular nucleus and peripheral low-signal rim.

Figure 4. Type II cavernoma in T1-weighted sequence, with central reticular nucleus and a zone of peripheral low-signal intensity, resulting from the accummulated hemosiderin.

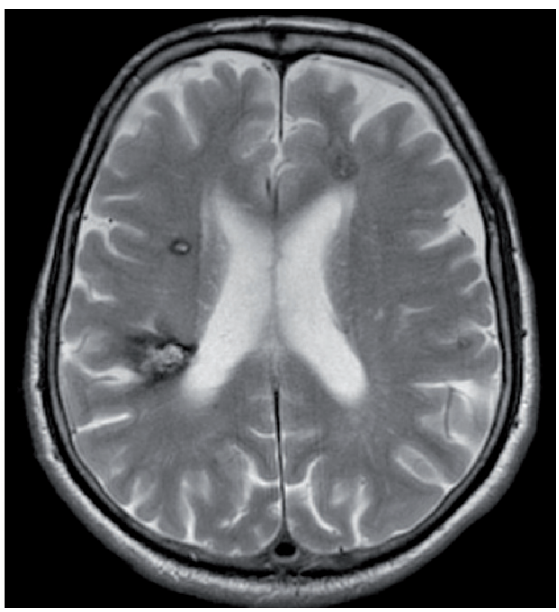


Figure 5. Type II cavernoma in T2-weighted sequence with a more clearly demarcated hemosiderin zone.

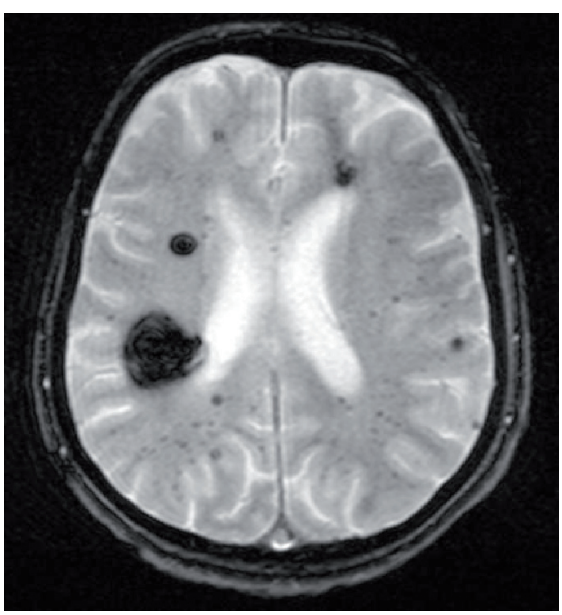
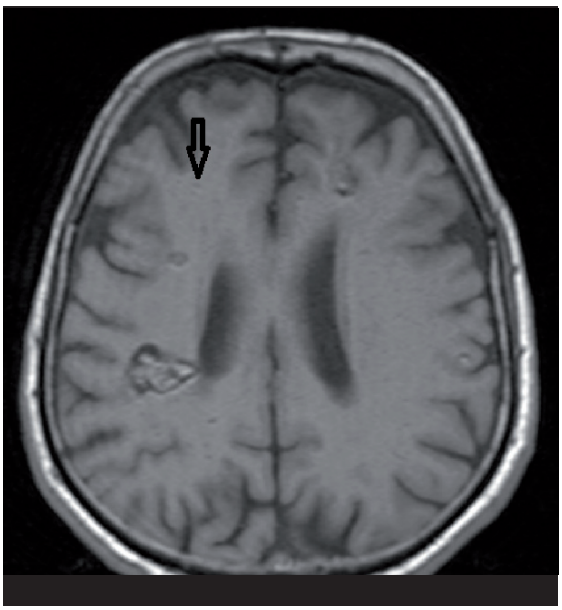


Figure 6. Type II cavernoma in T2 GRE sequence most clearly demarcating multiple Type II cavernomas as zones of low-signal intensity.



Type III lesion is characterized by chronic hemorrhage with hemosiderin within the lesion itself. With type III angiomas, the lesion is best displayed on the transverse T2 sequence as a zone of homogeneous low-signal intensity, as well as on GRE sequences, as shown in Figures 7, 8, 9.

Figure 7. T1-weighted sequence not clearly displaying Type III lesion.

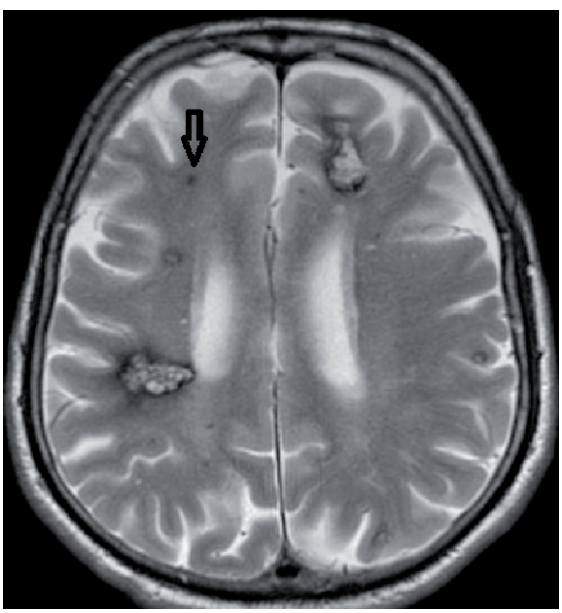


Figure 8. Clearly displayed uniform hyposignal Type III lesion on T2-weighted SE sequence.

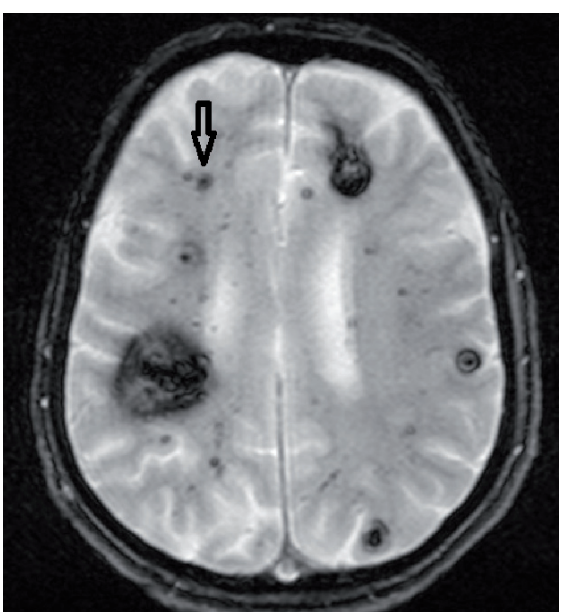
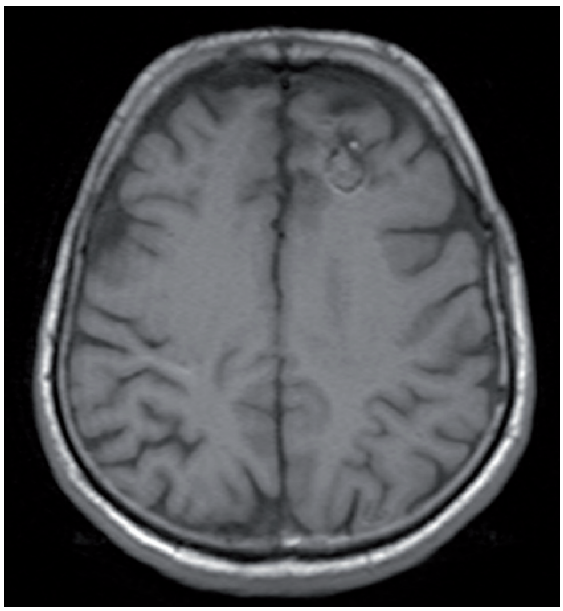


Figure 9. Type III lesion most clearly displayed on T2 GRE sequence.



Type IV is still an unclear type of lesion and may correspond to capillary telangiectasia or a cavernoma in an early stage of development. Type IV is characteristic of the familial form of cavernomatosis and is shown in Figures 10, 11 and 12.

The discrepancy between the SE and GRE findings of type IV cavernous angioma is a feature of the familial form of cavernous angiomatosis.

The obtained results in terms of the total number of cavernomas, number of lesions in asymptomatic and symptomatic patients, number of cavernomas found on T2 and GRE sequences and localization of cavernoma are presented in tables (Tables 1–5).

Figure 10. Type IV lesion not clearly displayed on T1-weighted sequence.

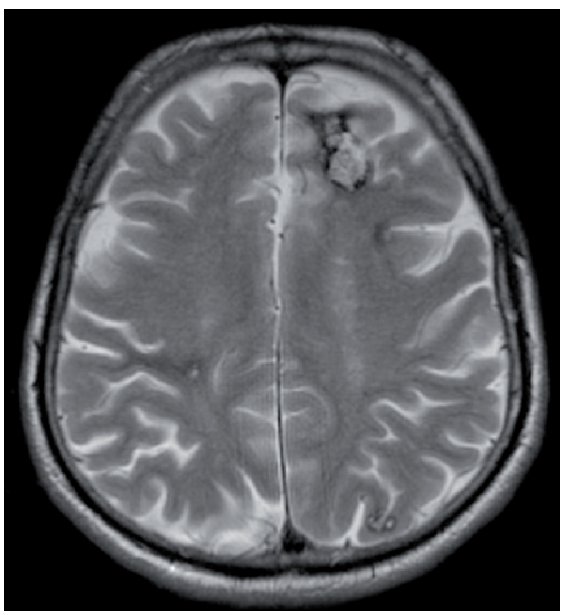


Figure 11. Type IV cavernoma not displayed on T2-weighted sequence.

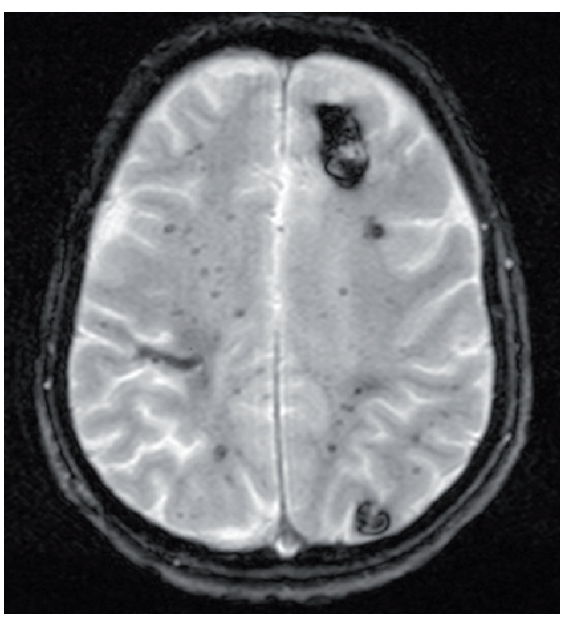


Figure 12. Hyposignal zones of multiple Type IV cavernomas in the white matter of the brain clearly displayed on T2 GRE sequence.

Table 1. Number of lesions in certain brain regions.

Region	Number of lesions
Brainstem	4 (0.98%)
Cerebellum	23 (5.70%)
Occipital lobe	97 (23.90%)
Parietal lobe	102 (25.12%)
Temporal lobe	116 (28.60%)
Frontal lobe	64 (15.80%)

Table 2. Total number of cavernomas seen on MR GRE and MR T2 sequences.

	GRE sequences	T2 sequences
Type I	4 (0.98%)	4 (6.66%)
Type II	46 (11.33%)	46 (76.68%)
Type III	10 (2.46%)	10 (16.66%)
Type IV	346 (85.23%)	*
*Type IV cavernomas may be detected on SE sequences		

Table 3. Number and location of lesions detected on MR T2-weighted sequences, in symptomatic and asymptomatic patients.

	Number of lesions		Location of lesion	
	Total number	Mean value*	Supratentorially	Infratentorially
Symptomatic patients	46	15.33	39 (84.8%)	7 (15.2%)
Asymptomatic patients	14	7	7 (50%)	7 (50%)
* Mean values represent calculated mean values of the number of lesions per patient				

Table 4. Number and location of lesions detected on MR GRE sequences.

	Number of lesions		Location of lesion	
	Total number	Mean value	Supratentorially	Infratentorially
Symptomatic patients	298	99.33	282 (94.6%)	16 (5.37%)
Asymptomatic patients	108	54	97 (89.8%)	11 (10.2%)
Numbers in brackets represent percentages				

Table 5. Distribution of the cavernoma types on MR GRE sequence, in symptomatic and asymptomatic patients.

	Type 1		Type 2		Type 3		Type 4	
	Number of lesions	Mean value*	Number of lesions	Mean value*	Number of lesions	Mean value*	Number of lesions	Mean value*
Symptomatic patients	4	1.33	35	11.66	7	2.33	252	84
Asymptomatic patients	0	0	11	5.5	3	1.5	94	47
* Mean values represent calculated mean values of the number of lesions per patient								

Discussion

Cavernous angioma belongs to a group of hamartomas of the blood vessels [12]. It is an occult malformation that is not displayed on the classic angiography. Multiple familial cavernous angiomatosis is defined by the existence of two or more brain lesions in two or more family members or by the presence of a gene mutation causing the disease [13, 14].

With the development of MR imaging, cavernomas are becoming the most commonly diagnosed vascular malformation of the brain, with a prevalence of 0.4–0.9%, as confirmed by autopsy findings. The familial form is present in 6–50% of all lesions, and is most often associated with the Latin American origin [15].

Clinical manifestation

Cavernous angiomas are most often clinically manifested as epileptic equivalents (38–55%), focal neurologic deficit (12–45%), non-specific headaches (5–55%) and intracranial hemorrhage (4–32%) [5]. Different studies speak about 10–90% of the symptomatic patients [16, 17]. Our findings suggest that 20% of the patients with the examined changes have epileptic seizures, 60% focal neurological deficits, 60% headache and 60% hemorrhage. Literature data [16] indicate that most patients become symptomatic between the third and fifth decade of life, while the results of our study show a slightly higher mean age of the patients, 51 years.

Asymptomatic patients

In our study, 40% of the patients are asymptomatic. The true incidence of familial form of the disease is probably concealed by a large number of asymptomatic patients.

Presence of multiple lesions in treated patients

Multiple lesions are found in 50–84% of the patients with the familial form of the disease [5]. Multiple changes are observed in all of the subjects from our study, more than 40 lesions per patient. According to most authors, there is no significant correlation between the number of changes in the brain and presentation of the disease, as our investigation also showed.

Number of lesions infratentorially and supratentorially

Literature data [5] indicate that the lesions are often positioned supratentorially (80–85%), whereas in our study the number of supratentorial lesions makes 76.66% of the total number seen on SE sequences, i. e. 93.34% of the total number of lesions seen on GRE sequences.

Number of lesions in certain brain regions

Of the total number of cavernomas, the largest number, i. e. 28.57%, is positioned in the temporal lobe and 25.12% in the parietal lobe, whereas the smallest number, i. e. 0.98%, is located in the brain stem (data from Table 1).

Number of lesions seen in T1, T2 and T2 GRE sequences

The total number of lesions seen on SE sequences in all treated patients is 60. The number of lesions seen on T2 GRE sequences in all the patients is 406. T2 GRE exploration is clearly more sensitive, compared to T1 and T2 sequences in presenting the cavernous angioma, which was statistically confirmed (data from Tables 2–5).

All our symptomatic patients have type I change, which is the cause of the neurological deficit or epileptic seizures. As there is no statistical significance in the total number of lesions in asymptomatic and symptomatic patients, the presence of type I lesions determines clinical presentation in our examined patients. According to the majority of available papers, the presence of type I and type II lesions determines the clinical picture (5.16).

The number of lesions increases with the patient's age. The oldest patient is 73 years old presenting with 187 changes, which proportionately increases by number, type and size of cavernoma.

The total number of changes regardless of the type of cavernoma in symptomatic patients is 298, in comparison to 108 in asymptomatic patients.

The total number of changes regardless of the type of cavernoma registered by exploration in T2 sequences is 60, and the number registered in GRE sequences is 406. After comparing the number of lesions found on T2 and T2 GRE sequences in all the patients, a significant difference was obtained by using the Wilcoxon signed-rank test ($Z = 2.023$, $p = 0.043$).

Type IV cavernoma was the most commonly found change, with a total number of 346.

By applying the Mann-Whitney U test, no significant difference was found in the medians of the number of lesions in SE sequences in asymptomatic and symptomatic patients ($U = 0.5$, $p = 0.139$, $r = 0.062$)

By applying the Mann-Whitney U test, no significant difference was found in the medians of the number of lesions in GRE sequences in symptomatic and asymptomatic patients ($U = 2$, $p = 0.564$, $r = 0.2576$). From the foregoing, it is concluded that the number of lesions does not have a major impact on the clinical presentation of the desease.

Changes relating to type I cavernoma were not found in asymptomatic patients. All three symptomatic patients had type I cavernoma which was the cause of the neurological deficits or epileptic seizures.

In the oldest of the symptomatic patients, 73 years of age, a total of 187 changes were registered. The youngest symptomatic patient had a total of 55 changes. Type IV cavernoma is the most frequently

encountered type of cavernomas. Literature data [5] confirm that the number of lesions and their size grow throughout life.

Conclusion

This paper deals with six family members from the first to third degree of consanguinity. In five patients, MRI revealed the existence of multiple cavernous angiomas. MR imaging of the brain is the method of choice in proving this type of vascular malformations. The superiority of MR GRE (Gradient Recalled Echo) sequences was shown to be superior in the diagnosis of lesions of the familial cavernous angiomatosis of the brain, making such images obligatory during the MR exploration of cavernomas due to their apparently greater sensitivity.

In the case of familial form of cavernous angiomatosis, the existence of Type IV cavernomas (classification according to Zabramski) is characteristic of the disease. Type IV cavernomas are detectable only when GRE sequences are used, as they cannot be detected by the classic SE exploration.

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PLEOMORFNI LIPOSARKOM

Pleomorphic liposarcoma

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Sažetak

Pleomorfni liposarkom je najrjeđi i najagresivniji tip liposarkoma koji najčešće zahvaća proksimalne dijelove ekstremiteta. Rijedak je u općoj populaciji, s većom incidencijom u starijoj dobi. Prikazujemo slučaj pacijenta starog 65 godina s tumorskom promjenom lokaliziranom u medijalnom proksimalnom dijelu lijevog femura. Nakon ekstirpacije tumora liječen je radioterapijom, a pojavom recidiva terapijskom protokolu dodana je kemoterapija. Terapijske mogućnosti prilagođuju se svakom pacijentu individualno, najčešće uključuju kiruršku ekstirpaciju i radioterapiju, a u pojedinim slučajevima je neizostavna i kemoterapija.

Ključne riječi

pleomorfni liposarkom, kirurška ekstirpacija, radioterapija, kemoterapija

Abstract

Pleomorphic liposarcoma is the rarest and the most aggressive type of liposarcoma which most commonly arises in proximal extremities. It is rare in general population, with a higher incidence in older age. We present a case of a 65-year-old patient with a tumor-related change localized in the medial proximal area of the left femur. After extirpation, the tumor was treated with radiotherapy and subsequently due to recurrence chemotherapy was initiated. Therapeutic options are adapted to each patient individually and most frequently involve surgical extirpation and radiotherapy, while in certain cases chemotherapy is needed as well.

Key words

pleomorphic liposarcoma, surgical extirpation, radiotherapy, chemotherapy

Uvod

Sarkomi su skupina heterogenih malignih tumora mezenhimalnog porijekla. Obuhvaćaju 1% svih odraslih i 12% pedijatrijskih malignih tumora. Sarkomi nastaju iz mekih tkiva (80%) ili iz same kosti (20%). U Sjedinjenim Američkim Državama (SAD) godišnje se dijagnosticira 12 310 novih slučajeva sarkoma mekih tkiva, uz 4990 smrti. Sarkomi gotovo uvijek nastaju de novo, a ne malignom alteracijom benigne lezije. Ne postoji jasno definirani etiološki čimbenik, no definirani su predisponirajući čimbenici kao npr. radioterapija, kemoterapija, genetska predispozicija (npr. Li-Fraumeni sindrom, neurofibromatoza tip I). Glavni simptom mekotkivnih sarkoma je bezbolna masa koja polagano raste. Ako naraste velika, može se prezentirati i bolovima, parestezijama i edemom uzrokovanim kompresijom. Nakon uspješne terapije primarnog sarkoma, 25% pacijenata će razviti metastaze. Incidencija metastaza raste na 40–50% ako je primarni tumor bio >5 cm, duboko u fasciji i srednjeg ili visokog stupnja [1].

Liposarkom je zloćudni tumor koji nastaje malignom alteracijom masnih stanica i obuhvaća 18% svih mekotkivnih tumora [2]. Klasificira se u četiri patohistološka tipa: dobro diferencirani, dediferencirani, miksoidni i pleomorfni. Pleomorfni liposarkom je najrjeđi od četiri tipa liposarkoma. Najčešća lokalizacija ovog tipa su proksimalni dijelovi ekstremiteta [3]. Prikazujemo slučaj pacijenta starog 65 godina koji je nakon ekstirpacije tumora liječen radioterapijom, a pojavom recidiva terapijskom protokolu dodana je kemoterapija.

Prikaz slučaja

Prikazujemo slučaj pacijenta starog 65 godina, kojem je dijagnosticiran pleomorfni liposarkom. U osobnoj anamnezi nema drugih komorbiditeta niti je teže bolovao. Tumor je dijagnosticiran 2013. godine u medijalnom proksimalnom dijelu lijeve natkoljenice te je napravljena ekstirpacija tumorske promjene. Potom je provedeno zračenje od 66 Gy u 33 frakcije do veljače 2014. godine. Početkom 2015. godine pacijent je primijetio da prilikom igranja nogometa otežano trči, a potom je napipao tvrdu izraslinu u području lijeve

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prepone prema skrotumu. Magnetska rezonancija (MR) lijeve natkoljenice i donjeg dijela zdjelice u veljači 2015. godine verificirala je recidiv – infiltrativni proces, djelomično solidan, djelomično cističan u medijalnom dijelu lijeve natkoljenice. Proces se širio u okolno masno tkivo ventralno od korijena penisa, a kaudalno u perinealno područje, bez infiltracije anusa. Napravljena je i pozitronska emisijska tomografija (PET CT) koja je pokazala patološku metaboličku aktivnost u području ekspanzivne tvorbe, što odgovara lokalnom recidivu tumorskog procesa, bez ovom metodom detektibilnih udaljenih metastatskih promjena. Do srpnja 2015. godine primio je šest ciklusa kemoterapije po MAID protokolu. Ponovno napravljeni PET CT pokazao je regresiju tumora te su aplicirana dodatna dva ciklusa kemoterapije po shemi MAID, tj. maksimalna kumulativna doza antraciklina kroz osam ciklusa kemoterapije. MR lijevog kuka (10./2015.) pokazao je tumorski proces u području medijalne skupine mišića, najvećim dijelom zahvaćajući *m. adductor magnus*, a manjim dijelom *m. adductor brevis* i *longus*. Konture sjednih kostiju bile su održane, bez promjena medule prikazanih koštanih struktura. U siječnju 2016. godine napravljen je CT s kontrastom koji pokazuje nalaz gotovo identičan postoperativnom nalazu. CT zdjelice s kontrastom (21.1.2016.) prikazuje tumorski proces koji na najdužem mjestu mjeri 9 cm. Lokalitet ekspanzivnog procesa je identičan (uspoređujući s prethodnim MR-om te CT-om). Nije nađena promjena u koštanim strukturama. Arterije zdjelice i natkoljenica su uredno prohodne i primjerene širine lumena. Nema znakova tumorske invazije vaskularnih struktura. U veljači 2016. godine pacijent navodi osjećaj zatezanja i pritiska te bol pri sjedenju i stajanju u proksimalnom medijalnom dijelu lijeve natkoljenice, koju može dići do 75 stupnjeva. Zaprimljen je na Zavod za plastičnu kirurgiju zbog odluke o operacijskom liječenju recidiva pleomorfnog liposarkoma lijeve natkoljenice. Operacija je započeta pristupom na aduktornu muskulaturu medijalno duž natkoljenice, dodatno šireći inciziju horizontalno na oba kraja vertikalnog reza prema ventralno i dorzalno te iznad skrotuma. Potom je napravljena ekstirpacija tumorske tvorbe s pripadajućim mišićima – *m. gracilis* te *m. adductor magnus* – od razine polovice natkoljenice do hvatišta na pubičnu kost. Rubni preparat je poslan na hitni PHD koji javlja pozitivne rubove. Ekscizija se dodatno proširila u dublji sloj mišića *m. adductor magnus*. Završni PHD nalaz pokazao je uredan distalni resekcijski rub prema skeletnom mišiću, uz prisutnost tumora u masnom tkivu na suprotnom rubu, prema zdjelici. S obzirom na to da bi proširenje operacijskog zahvata, u smislu dodatne resekcije mišićnog tkiva, dovelo do gubitka funkcije natkoljenice, konzultacijom onkologa odlučeno je da se pacijent nakon otpusta iz bolnice uputi na dodatno zračenje. Postoperacijski tijek je bio uredan te je pacijent zadovoljavajućeg općeg stanja i lokalnog nalaza u ožujku 2016. godine otpušten na kućnu njegu.

Rasprava

Smjernice za liječenje pleomorfnog liposarkoma nisu jasno definirane [3]. Kirurška ekstirpacija tumorske promjene je osnovna metoda terapijskog postupka. Adjuvantna radioterapija poboljšava funkcionalni oporavak zahvaćenog ekstremiteta te ujedno smanjuje komorbiditete i estetske deformitete [4]. U prikazanom slučaju napravljena je ekstirpacija tumorske promjene te je potom provedena radioterapija. Kemoterapija nije prihvaćena kao standard u liječenju [4]. Studije ipak navode kemoterapiju kao jednu od mogućnosti postoperativnog liječenja kod bolesnika zadovoljavajućeg općeg stanja [5]. Dvije meta-analize i više od 20 randomiziranih studija ističu potencijalnu važnost adjuvantne kemoterapije u liječenju reseciranih mekotkivnih tumora ekstremiteta kod odraslih [6]. Jedna od provedenih studija je i multicentrična randomizirana studija koja je istražila učinak adjuvantne kemoterapije na preživljenje pacijenata s reseciranim mekotkivnim sarkomima. Uključen je 351 pacijent s makroskopski reseciranim sarkomima neovisno o lokalizaciji, Trojani gradusa II–III, bez metastaza, prema ECOG (*Eastern Cooperative Oncology Group*) ljestvici statusa manjeg od 2 i starih između 16 i 70 godina. Podijeljeni su u dvije skupine; skupinu koja prima adjuvantnu kemoterapiju (175 pacijenata) i kontrolnu skupinu (176 pacijenata). Kemoterapija se sastojala od pet ciklusa doksorubicina, ifosfamida i lenograstima svaka tri tjedna. Pacijenti iz obje skupine primili su radioterapiju ako je tumor marginalno reseciran ili je bio recidiv. Ukupno preživljenje nije se značajnije razlikovalo ([HR]0,94 [95% CI 0,68–1,31], p=0,72) kao ni period bez relapsa (HR 0,91 [0,67–1,22], p=0,51). Petogodišnje preživljenje bilo je 66,5% (58,8–73,0) u skupini koja je primila kemoterapiju i 67,8% (60,3–74,2) u kontrolnoj skupini. Interpretacijom ovih rezultata zaključeno je da ovaj oblik adjuvantne kemoterapije nema koristi u ukupnom preživljenju kao ni u periodu bez relapsa [7]. Sljedeća randomizirana studija istraživala je utjecaj adjuvantne kemoterapije bazirane na epirubicinu (sa ili bez ifosfamida) na relaps bolesti i na stopu preživljenja kod pacijenata s reseciranim mekotkivnim sarkomima. Uključeno je 88 pacijenata, od čega je 45 pacijenata podvrgnuto kirurškom zahvatu te je dodatno liječeno kemoterapijom. Studija je prijevremeno zatvorena zbog slabijeg prirasta pacijenata, ali je ukazala na statistički važnu razliku u petogodišnjem preživljenju pacijenata dodatno liječenih adjuvantnom kemoterapijom. Skupina liječenja kemoterapijom u 69% slučajeva nije imala relaps bolesti u narednih pet godina u usporedbi sa 44% pacijenata iz skupine koja je liječena kirurškim zahvatom sa ili bez radioterapije. Petogodišnje preživljenje je iznosilo 72% u skupini liječenoj

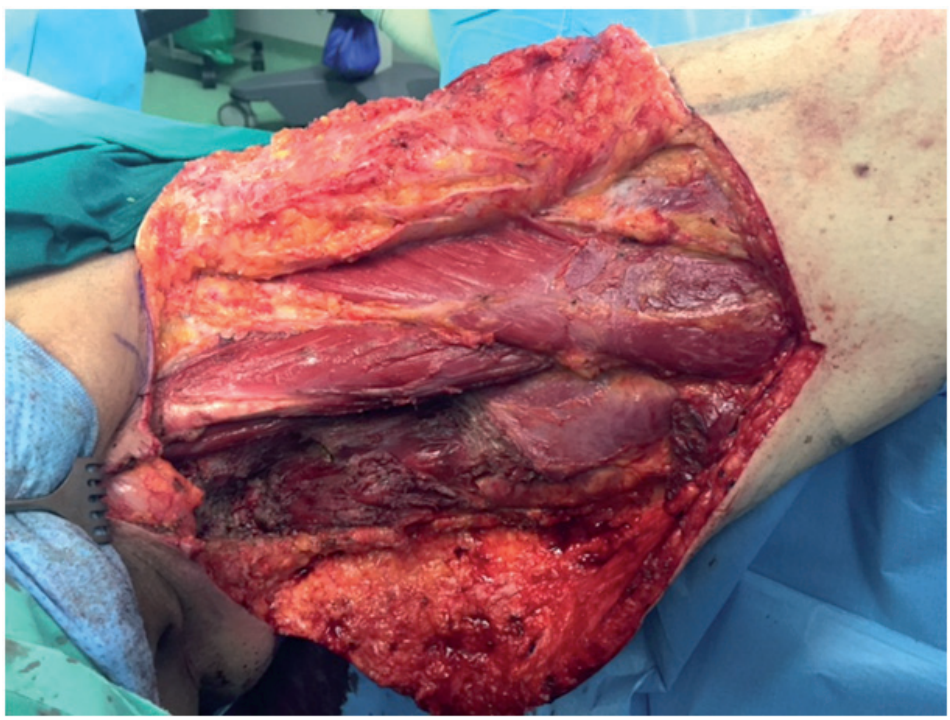
epirubicinom, a 47% u kontrolnoj skupini. Vidljiv je određeni povoljan učinak kemoterapije na petogodišnje preživljenje pacijenata s visokim rizikom relapsa bolesti [8]. Provedena je i studija koja je istraživala utjecaj adjuvantne kemoterapije, tj. IFADIC protokola na preživljenje pacijenata sa širokom resekcijom mekotkivnih sarkoma stadija II i III. Dokazana je umjerena toksičnost ovog terapijskog protokola baziranog na ifosfamidu, dakarbazinu i doksorubicinu. Studija zaključuje da ovaj terapijski protokol ne doprinosi značajnijem povećanju stope preživljenja i smanjenja stope relapsa bolesti u usporedbi s kontrolnom skupinom liječenom radioterapijom nakon kirurškog zahvata. U zaključku je naznačen određeni povoljan učinak adjuvantne kemoterapije na mekotkivne tumore stadija III, ali za konačnu potvrdu potrebne su daljnje studije i veći broj pacijenata [9].

Postoji više odabranih terapijskih protokola za liječenje mekotkivnih tumora. Najčešće primjenjivani protokoli u praksi su: AIM (doksorubicin, ifosfamid, mesna), MAID (mesna, doksorubicin, ifosfamid, dakarbazin) i AD (doksorubicin, dakarbazin) [10]. U našem slučaju, nakon potvrđenog lokalnog recidiva, provelo se liječenje po MAID protokolu. Aplicirana je maksimalna kumulativna doza antraciklina kroz osam ciklusa. Zadnje smjernice daju prednost AIM protokolu ispred MAID protokola, jer omogućuje apliciranje maksimalnih doza dva najučinkovitija lijeka za sarkome, tj. doksorubicina i ifosfamida, bez mijelotoksičnog učinka dakarbazina. SMAC (*Sarcoma Meta-Analysis Collaboration*) prema posljednjim studijama ističe važnost adjuvantne kemoterapije jer povećava preživljenje za 11% u odnosu na samu ekstirpaciju [6]. Studije navode da je kod bolesnika s neresektabilim tumorskim nalazom i detektabilnim udaljenim metastatskim promjenama, a prethodno liječenih antraciklinom (npr. MAID protokol), eribulin dodatna mogućnost liječenja [10]. Posljednja istraživanja ističu važnost koadjuvantne radioterapije i kemoterapiju u formiranju budućih terapijskih protokola [3]. Ne postoji standardiziran način primjene kemoterapije, već se individualno pristupa svakom bolesniku, ovisno o općem stanju, komorbiditetima, lokaciji i veličini tumora te histološkom tipu. Učinkovitost kemoterapije mora biti veća od njene toksičnosti, tj. njezinih nuspojava u vidu sterilnosti, kardiotoksičnosti, nefrotoksičnosti i potencijalnog razvoja sekundarnih tumora [6].

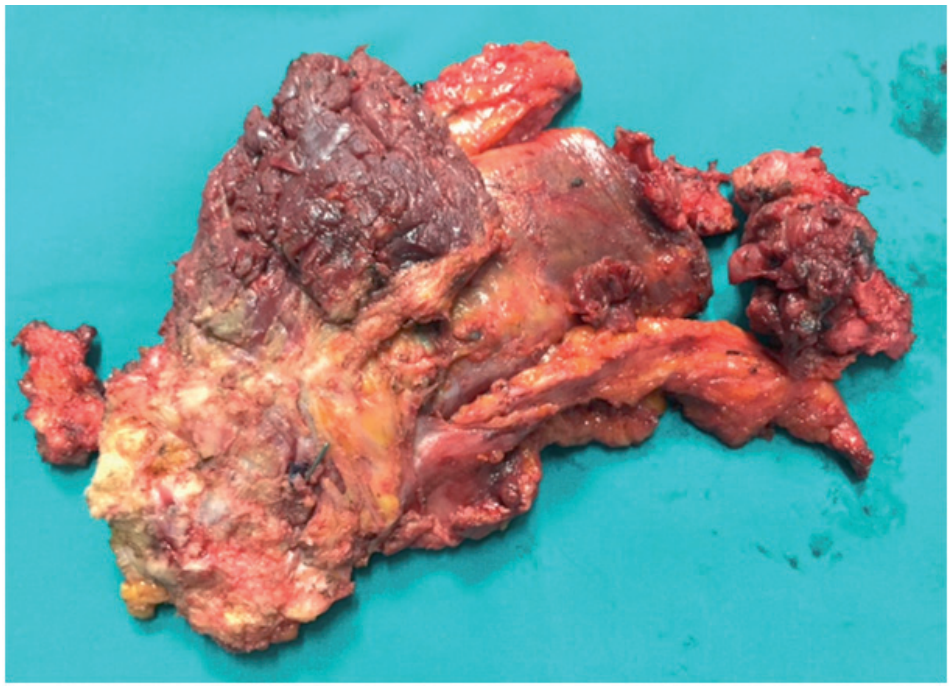
Zaključak

Pleomorfni liposarkom je slabo diferencirani tumor, rijedak u općoj populaciji, s većom incidencijom u starijoj dobi. Terapijske mogućnosti obuhvaćaju kiruršku ekstirpaciju i radioterapiju, a u pojedinim slučajevima neizostavna je i kemoterapija. Korist kemoterapije kao dijela terapijskog protokola mora biti veća od njezine toksičnosti te mora odgovarati općem stanju pacijenta [6]. Studije navode široku lokalnu ekstirpaciju i postoperativnu radioterapiju kao temelj u sprečavanju lokalnog recidiva [4].

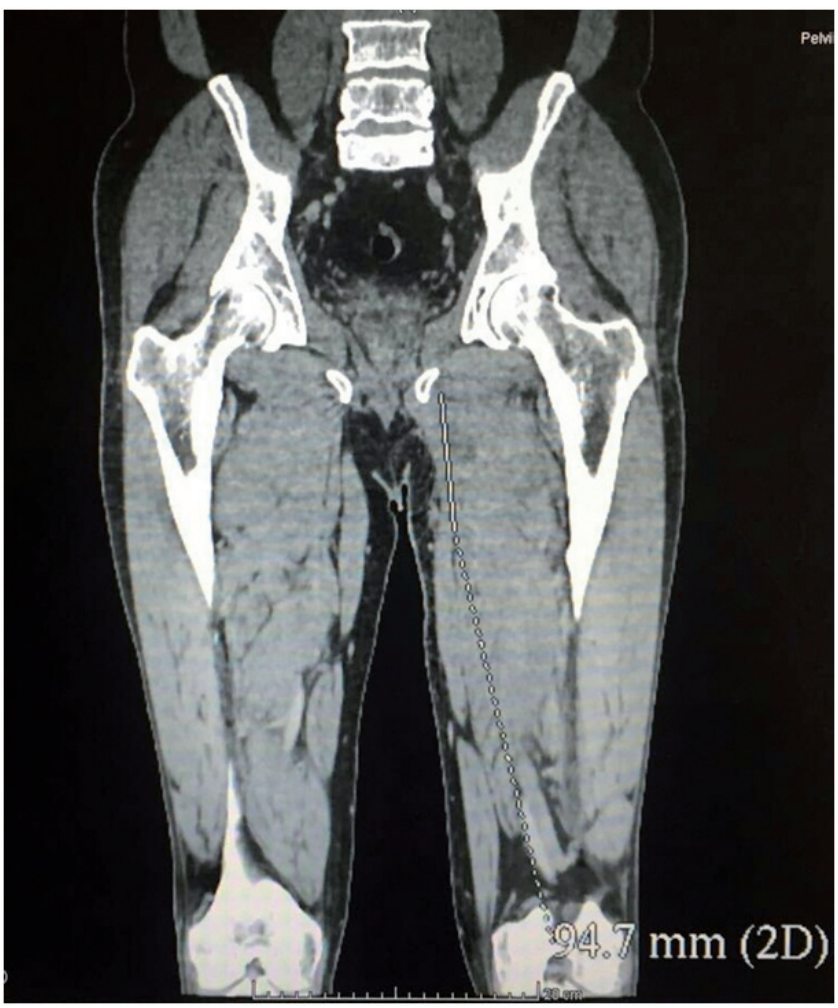
Slika 1. Intraoperacijska slika medijalne strane lijeve natkoljenice, stanje nakon blok disekcije tumorske mase.



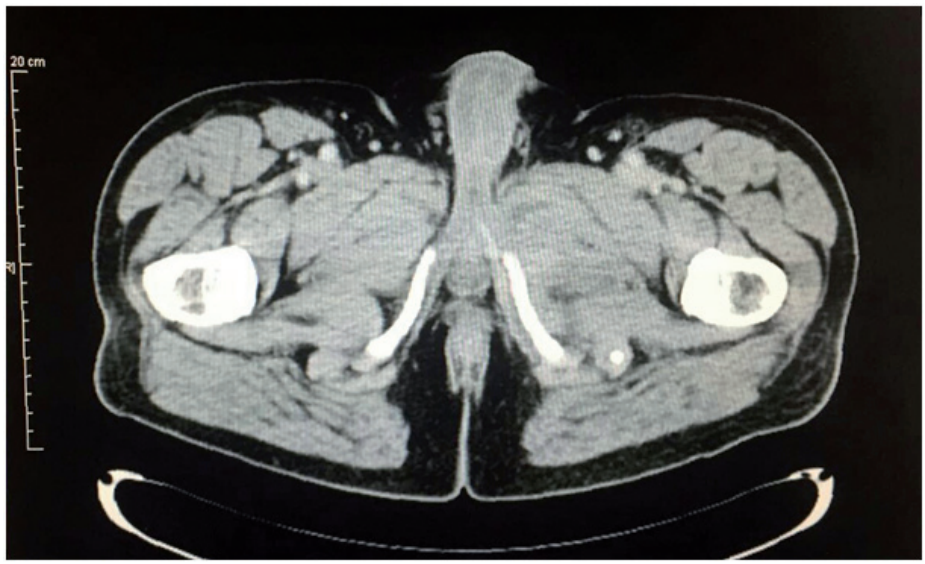
Slika 2. Intraoperacijski snimak medijalne strane lijeve natkoljenice, stanje nakon blok disekcije tumorske mase.



Slika 3. CT prikaz, koronarni presjek. Tumorski proces lokaliziran u proksimalnom medijalnom dijelu lijeve natkoljenice.



Slika 4. CT prikaz, aksijalni presjek



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Acta Chir Croat 2016; 13: 59

IN MEMORIAM

Prim. Julijan Plančak

17. travnja 1928. – 3. svibnja 2015.

Dana 3. 5. 2015. godine, nakon kratke i teške bolesti, u 87. godini života napustio nas je dugogodišnji djelatnik Kirurške klinike KBC-a Zagreb prim. dr. Julijan Plančak.

Rođen je 17. 4. 1928. u Petrovcima kod Vukovara.

Nakon osnovne škole koju je pohađao u Petrovcima upisao je realnu gimnaziju u Vukovaru gdje je i maturirao 1948. godine. Nakon tri semestra na Veterinarskom fakultetu Sveučilišta u Zagrebu, upisao je Medicinski fakultet na istom Sveučilištu na kojem je i diplomirao 1955. godine, a nakon čega je 1957. započeo uobičajeni liječnički staž prema tada važećim propisima. Od 21. 10. 1958. do 31. 10. 1961. radio je kao liječnik u Zdravstvenoj ordinaciji Živinica (Tuzla, BiH) gdje je obnašao i dužnost upravnika.

Od 3. 11. 1961. radi u Kliničkoj bolnici Medicinskog fakulteta u Zagrebu kao liječnik na specijalizaciji iz opće kirurgije. Specijalistički ispit položio je 2. 6. 1967. i od tada kao specijalist opće kirurgije radi u Kliničkom bolničkom centru Zagreb.

Tijekom svog radnog vijeka obnašao je više odgovornih dužnosti pa je tako 1980. preuzeo obavezu vršioca dužnosti poslova i radnih zadataka rukovoditelja gastro-duodeno-entero-pankreatičnog odjela Zavoda za gastroenterologiju Klinike i Zavoda Rebro. Dana 15. 3. 1983. u zvanju liječnika specijalista imenuje se rukovoditeljem II. odjela digestivne kirurgije Klinike za kirurgiju, a 1984. imenovan je šefom odjela.

Na tom radnom mjestu ostaje do 1987. kada je imenovan voditeljem III. digestivnog odjela (opća gastroenterologija i endokrinologija). Na toj dužnosti ostaje do umirovljenja 31. 5. 1993. godine.

Bio je član Zbora liječnika Hrvatske i u jednom mandatu (1986.) predsjednik zagrebačke podružnice Zbora.

Zahvaljujući svom izvrsnom i predanom stručnom kirurškom radu dodijeljena mu je titula primarijusa. Cijeli je život posvetio kirurgiji i svojim pacijentima kojima je spašavao živote i/ili olakšavao patnje.

Osim radom u okviru Kirurške klinike KBC-a Zagreb prim. Julijan Plančak bio je i društveno aktivan te je tako u dva mandata bio odbornik Gradske skupštine grada Zagreba, a 1985/86 njezin potpredsjednik.

U svom radnom vijeku, osim rada u operacijskoj sali i na odjelu, prim. Plančak je objavio više znanstvenih radova i rasprava, a posebnu pažnju posvetio je edukaciji mladih liječnika i kirurga. Bio je dragocjen učitelj u postavljanju dijagnoze te naročito u praktičnoj primjeni kirurške tehnike i učenju kirurških principa i vještina.

Kao takav će ostati u trajnom sjećanju svojih kolega i učenika.

Kolektiv Klinike za kirurgiju KBC-a Zagreb

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IN MEMORIAM

Prof. dr. sc. Vjekoslav Nanković

17. siječnja 1936. – 6. srpnja 2015.

Nakon teške bolesti shrvan profesijom kirurga napustio nas je u 79. godini života prof. dr. sc. Vjekoslav Nanković, rođeni Zagrepčanin koji je ugledao svoj životni put 17. siječnja 1936. godine. U Zagrebu završava osnovnu školu i Klasičnu gimnaziju. Nakon završenog osnovnog i gimnazijskog obrazovanja, 1954. godine upisuje Medicinski fakultet u Zagrebu te nakon završenog fakulteta 1963. godine obavlja liječnički staž u Bjelovaru i Zagrebu.

Nakon odsluženja vojnog roka i položenog stručnog ispita 1967. godine započinje specijalizaciju iz opće kirurgije u Vojnoj bolnici u Zagrebu kao građansko lice na službi u JNA. Specijalistički ispit položio je 1971. godine te sljedeće godine dobiva radno mjesto kao šef kirurškog odjela KPD bolnice u Zagrebu.

Već od svoje rane kirurške edukacije zavolio je traumatologiju te 1975. godine prelazi u tadašnju Traumatološku bolnicu gdje radi kao odjelni liječnik. Tu se susreće sa znanstvenim radom te 1979. godine, odmah po osnutku postdiplomskog studija, upisuje studij opće kirurgije koji uspješno završava 1981. godine. Tijekom 1982. godine uspješno je obranio magistarski rad pod mentorstvom prof. dr. sc. Vasilija Nikolića iz područja biomehanike, tj. upotrebe vanjskog fiksatora kod kompliciranih prijeloma.

Odmah nastavlja sa studijem biomehaničke problema–tike te brani svoju doktorsku disertaciju 1985. godine pod naslovom „Prilog liječenja kompliciranih prijeloma potkoljenice metodom vanjske fiksacije".

Radeći godinama kao stručnjak na Odjelu za povrede kralješnice Traumatološke bolnice aktivno sudjeluje u svakodnevnom kirurškom radu te unapređuje i uvodi nove tehnike zajedno sa svojim voditeljem (prof. dr. sc. Zimmerman) kojeg kasnije nasljeđuje kao voditelj odjela te još više doprinosi razvoju i napretku Odjela za ozljede kralješnice, koji postaje s ekipom tada mladih, ali iskusnih kirurga praktički jedini odjel za liječenje kralješnice u državi. Njihovi uspjesi te dolaskom mlađih kadrova (prof. dr. sc. Buljat, prim. dr. Z. Kejla) postižu zavidne rezultate u radu s težim ozljedama iz područja traumatologije.

Zanesen svojim znanstvenim i stručnim radom prof. dr. V. Nanković tijekom svog života aktivno sudjeluje u nekoliko znanstvenih i stručnih projekata kao istraživač, predavač te organizator stručnih sastanaka u sklopu Traumatološke klinike čiji rad unapređuje. Također, organizira nekoliko stručnih kongresa iz područja Greške u traumatologiji za cijelu bivšu državu na visokoj stručnoj i znanstvenoj razini.

Kao mladi i iskusni kirurg nakon položenog magisterija uključen je kao predavač u postdiplomski studij iz opće kirurgije te kasnije nakon položenog doktorskog studija aktivno sudjeluje kao predavač u radu Katedre za kirurgiju kao voditelj nastave iz područja ratne kirurgije.

Kao pročelnik Zavoda za ozljede kralješnice Traumatološke klinike aktivno se uključuje u rad Klinike tijekom Domovinskog rata i obnaša odgovorne dužnosti u organizaciji zdravstvene službe i zbrinjavanju ratnih bolesnika. Odmah nakon rata organizira zajedno s Austrijskim kirurškim društvom savjetovanje iz Ratne traumatologije i načina zbrinjavanja povrijeđenih osoba na međunarodnoj razini u Grazu. Baš takve organizacije međunarodnih skupova i iskustva koja smo tada stekli (praktički jedini u Europi) doprinijeli su uspjehu te potvrdili visoke domete hrvatske traumatologije koja je s uspjehom savladala sve nedaće koje su nas zadesile u tom trenutku.

U svom radu bio je prepoznat od mnogih stručnjaka iz relevantne struke, kako u Hrvatskoj tako i u cijelom svijetu, te je aktivno sudjelovao na nizu međunarodnih i domaćih kongresa u cijelom svijetu.

Autor je cijelog niza stručnih i znanstvenih radova koji su citirani u svim međunarodnim časopisima (ukupno 86 stručnih i znanstvenih radova) te kao vrlo aktivan i agilan traumatolog prepoznat je od strane Grada Zagreba te mu je 1988. godine dodijeljeno Priznanje Grada Zagreba za posebne zasluge.

Nakon rata bio je načelnik udruge Poslodavaca u zdravstvu u jednom mandatu.

Bio je jedna od ključnih osoba naše traumatologije. Radio je na razvoju traumatologije, a posebice razvoju vertebralne traumatologije gdje je ostavio zavidan trag, kako u praktičnom tako i u teoretskom dijelu. Kao učitelj odgajao je cijeli niz mladih kirurga vertebralnih traumatologa. Sačuvat ćemo trajnu i najljepšu uspomenu na plemenitog liječnika, kirurga, prijatelja.

Prof. dr. sc. Slavko Davila

Acta Chir Croat 2016; 13: 63–67

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Instructions for authors

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Sažeci: autori, naslov, časopis, volumen, stranica, godina, broj sažetka; npr. Proc Am Soc Clin Oncol 2007;25:215s (abstr 4571).

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Knjiga: Blenkinsopp A, Paxton P. Symptoms in the pharmacy: a guide to the management of common illness. 3rd ed. Oxford: Blackwell Science; 1998.

Poglavlje knjige: Wyllie AH, Kerr JFR, Currie AR. Cell death: the significance of apoptosis. In: Bourne GH, Danielli JF, Jeon KW, editors. International review of cytology. London: Academic; 1980. pp. 251–306.

DOI članak: Slifka MK, Whitton JL (2000) Clinical implications of dysregulated cytokine production. J Mol Med (in press). DOI: 10.1007/s103530000086.

Internetski dokument: Doe J (1999) Title of subordinate document. In: The dictionary of substances and their effects. Royal Society of Chemistry. Available via DIALOG. http://www.rsc.org/dose/title of subordinate document. Cited 15 Jan 1999.

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References may be made to published work and papers in press. Reference citations are not permitted in the abstract of a paper. Authors are responsible for the accuracy of all literature citations. Work in progress, in preparation, unpublished work and personal communications should be cited as footnotes to the text. References should be listed numerically in the text in the order of appearance as parenthesized consecutive numbers, e.g. [1, 2]. Where there are more than two references, the citation should appear as a range of numbers separated by a dash, e.g. [1–3]. Abbreviations of journals should conform to those used in Medline.

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Journal article with maximum six authors: all of the authors are listed. Journal article with more than six authors: only the first three authors are listed followed by "et al.".

Journal article in press (manuscript has been accepted for publication): Journal name (in press).

Abstracts: authors, title, journal, volume, page, year, abstract number, e.g. Proc Am Soc Clin Oncol 2007;25:215s (abstr 4571).

References should be quoted according to the Vancouver Format (Ref.), e.g. Journal article Smith JJ. The world of science. Am J Sci 1999;36: 234–5.

Book: Blenkinsopp A, Paxton P. Symptoms in the pharmacy: a guide to the management of common illness. 3rd ed. Oxford: Blackwell Science; 1998.

Book chapter: Wyllie AH, Kerr JFR, Currie AR. Cell death: the significance of apoptosis. In: Bourne GH, Danielli JF, Jeon KW, editors. International review of cytology. London: Academic; 1980. pp. 251–306.

Article by DOI: Slifka MK, Whitton JL (2000) Clinical implications of dysregulated cytokine production. J Mol Med (in press). DOI: 10.1007/s103530000086.

Online document: Doe J (1999) Title of subordinate document. In: The dictionary of substances and their effects. Royal Society of Chemistry. Available via DIALOG. http://www.rsc.org/dose/title of subordinate document. Cited 15 Jan 1999.

Always use the standard abbreviation of a journal's name according to the ISSN List of Title Word Abbreviations, see www.issn.org.

Text

1. Please write your text in Microsoft Word. Use a Times New Roman plain font 12 for text.
2. Use the automatic page numbering function to number the pages.
3. Do not use field functions.
4. For indents use tab stops or other commands, not the space bar.
5. Use the table functions of your word processing program, not spread sheets, to make tables. For equations use the Microsoft Word equation editor or Math Type.
6. Place all figure captions or tables at the end of the manuscript.
7. Submit all figures as separate files and do not integrate them in the text.

Figures and Tables

The preferred figure formats are EPS for vector graphics exported from a drawing program and TIFF for halftone illustrations. EPS files should contain a preview in TIFF of the figure. The file name (one file for each figure) should include the figure number. Figure captions should be included in the text and not in the figure file. Scan resolution: scanned line drawings should be digitized with a minimum resolution of 800 dpi relative to the final figure size. For digital half tones, 300 dpi is usually sufficient.

Color illustrations: Store color illustrations as CMYK in TIFF format.

Vector graphics: All fonts used in the vector graphics must be embedded. The minimum line width should be 0.2 mm (i.e. 0.567 pt) relative to the final size.

The number and final size of illustrations and tables must be kept to the minimum required for clarification of the text. Do not give the same data both in tables and graphs. Do not use pie charts. Do not integrate figures or tables into the text. Number figures and tables consecutively in separate series. In addition to the number, each figure must have a legend and each table must have a title. All figures and tables must be cited in the text. Plan figures to fit into the column

width of 81 mm. The maximum space available on one page is 169 by 240 mm. Scale the length, width, point size of type and symbols, and line weights of a figure proportionally. At the final size of a figure, no capital letter or symbol should be smaller than 1.5 mm and no line weight should be less than 0.25 mm. Group the legends for figures on a separate sheet. Give the title and all footnotes of a table directly above and below the table.

Full Paper and Review

Full papers and reviews should be written as concisely as possible without impairing the clear and precise presentation of the subject matter. Both form and content of the paper should be carefully checked to exclude the need for corrections.

Short Communication

Short communications should be prepared as described above except for the following: the average length of short communications should not exceed 1500 words and a maximum of two figures or tables is accepted. The abstract should not exceed 80 words.

Case Report

Case reports should have educational value and/or highlight the need for a change in a certain clinical practice. They must provide an original description of a previously unreported entity or report a new presentation of a known disease or a new perspective of a case which poses a diagnostic and therapeutic challenge. Case reports should include a comprehensive review of similar cases and emphasize the differences between present case and the previous ones. Case reports should be accompanied by clinical images. Authors should seek from the patients a written and signed consent to publish the information.

Letter to the Editor

Letters to the editor are welcome, they should contain a maximum of 750 words, and may include a table or figure and references.

Corrections

All necessary corrections will be sent by e-mail to the corresponding author. The costs of corrections and changes, except the ones made in typesetting, which exceed 10% of typesetting costs, and were made after page numeration, will be charged to the author.