

## REKONSTRUKCIJA POSTOPERATIVNIH FARINGOKUTANIH FISTULA DUPLIM OSTRVASTIM PEKTORALIS MAJOR MIŠIĆNO-KOŽNIM REŽNJEM

### RECONSTRUCTION OF POSTOPERATIVE PHARYNGOCUTANEOUS FISTULAS WITH DOUBLE ISLAND PECTORALIS MAJOR MYOCUTANEOUS FLAP

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#### Kratak sadržaj

Zatvaranje (PFKF) postoperativnih faringokutanih fistula, nastalih posle totalne laringektomije zbog karcinoma larinksa, kod prethodno radioterapijski tretiranih bolesnika, predstavlja ozbiljan problem u rekonstruktivnoj hirurgiji.

U ovom radu prikazana je mogućnost primene duplog ostrvastog pektoralis major mišićno-kožnog režnja, za rekonstrukciju postoperativnih faringokutanih fistula.

U periodu od 1997. god. do 2001. god. na ORL klinici u Nišu operisano je 124 bolesnika zbog malignog tumora larinksa a ukupan procenat PFKF iznosio je 13,71%. Kod 5(6,2%) bolesnika postoperativno su nastale velike (prečnika preko 3cm) postoperativne faringokutane fistule. Kod ovih bolesnika je rađena dvoslojna rekonstrukcija PFKF duplim ostrvastim pektoralis major mišićno-kožnim režnjem.

Primena ovakvog režnja je uspešnija od primene pektoralis major mišićno-kožnog režnja prekrivenog autotransplantatom kože, jer obezbeđuje kvalitetnije dvoslojno zatvaranje fistule, a postoperativna nega je daleko jednostavnija.

**Ključne reči:** laringektomija, faringokutana fistula, režanj, dupli, ostrvasti, pektoralis major

#### Uvod

Pektoralis major mišićno-kožni režanj (PMMKR) prvi put su opisali Hueston i McConchie 1968. g.<sup>1</sup>, kada su upotrebili ovaj režanj za

#### Abstract

Reconstruction (PPCF) of postoperative pharyngocutaneous fistulas, that occurred after total laryngectomy due to larynx carcinoma, in previously irradiated patients, presents a serious problem in reconstructive surgery.

In this paper we demonstrated the possibility of application of double island pectoralis major myocutaneous flap, for reconstruction of postoperative pharyngocutaneous fistulas.

In period from 1997 to 2001, we operated 124 patients for malignant laryngeal tumor and the total number of PPCF was 13.71%. Five (6.2%) patients presented large (3cm in diameter) postoperative pharyngocutaneous fistulas. In these patients, a double-layer reconstruction of PPCF was performed by means of double island pectoralis major myocutaneous flap.

The application of this flap is more successful than the application of pectoralis major myocutaneous flap, covered by skin autotransplant, because it provides better a double-layer closure of the fistula, and postoperative care is much simpler.

**Key words:** laryngectomy, pharyngocutaneous fistula, double, island, pectoralis major

#### Introduction

Pectoralis major myocutaneous flap (PMMF) was first described by Hueston and McConchie<sup>1</sup> in 1968, when they used this flap to

pokrivanje defekta prednjeg zida grudnog koša. Upotrebu PMMK za rekonstrukciju defekata glave i vrata prvi je opisao Ariyan 1979 godine.<sup>2</sup>

Postoperativne faringokutane fistule (PFKF) nastaju iz više razloga: zbog neadekvatne rekonstrukcije tkiva po slojevima, grube manipulacije tkivom, usled hematoma, infekcije, vremenski kratke sukcione drenaže, prethodne radioterapije itd.<sup>3-9</sup> Lečenje PFKF je ozbiljan problem jer one znatno produžavaju postoperativno vreme i oporavak bolesnika.<sup>9-13</sup> Ove fistule mogu dovesti do velikih teškoća u ishrani bolesnika, teških metaboličkih poremećaja i anemije, psihičkih poremećaja, depresije bolesnika i njihovog otudjenja od okoline.<sup>13,14</sup>

Zbog navedenih razloga važno je pristupiti rekonstrukciji PFKF u optimalnom vremenskom roku. U stručnoj javnosti mišljenja su podeljena oko adekvatnog vremena za rekonstrukciju PFKF; neki autori smatraju da fistulu treba odmah zatvarati dok su drugi autori mišljenja da treba čekati i po nekoliko meseci.<sup>4-8,12,14,15</sup>

PFKF nastale na terenu gde je prethodno sprovedena radioaterapija, predstavljaju ozbiljan problem u rekonstrukciji tkiva.

Najčešće korišćeni reznjevi u rekonstrukciji PFKF su sledeći mišićni ili mišićno-kožni reznjevi: pektoralis major, deltopektoralni režanj i/ili sternokleidomastoidni režanj.

U ovom radu smo prikazali rezultat zatvaranja velike postoperativne faringokutane fistule (PFKF) primenom duplog ostrvastog pektoralis major mišićno-kožnog reznja.

## ***Prikaz slučaja***

U periodu od 1997. god. do 2001. god. na ORL klinici u Nišu operisano je 124 bolesnika zbog malignog tumora larinksa. Od ukupnog broja operisanih, kod 17 (13,71%) bolesnika, u postoperativnom periodu došlo je do pojave faringokutanih fistula. Sve fistule javile su se kod bolesnika sa totalnom laringektomijom. Kod 3(3,72%) bolesnika fistule su rekonstruisane sa ostrvastim pektoralis major mišićno-kožnim reznjevima.

Velike PFKF, prečnika preko 3 cm koje su nastale kod 5(6,2%) bolesnika i gde je okolno tkivo izloženo prethodno radioaktivnom

cover the defects of front wall of chest cavity. The use of PMMF for reconstruction of head and neck defects was described by Ariyan in 1979.<sup>2</sup>

Postoperative pharyngocutaneous fistulas (PPCF) occur for several reasons: because of inadequate tissue reconstruction by layers, rough tissue manipulation, hematoma, infection, short time of suction drainage, previous radiotherapy, and etc.<sup>3-9</sup> The treatment is a serious medical problem because of the prolonging of postoperative period and patient recovery.<sup>9-13</sup> These fistulas can lead to great difficulties in patient's food intake, severe metabolic disturbances and anemia, psychological disturbance, depression and isolation from society.<sup>13,14</sup>

All these reasons emphasize the importance of optimal timing for the treatment of fistulas. Opinions are divided as to the appropriate time for PPCF reconstruction, some authors think that the fistula should be closed immediately while other propose waiting up to several months.<sup>4-8,12,14,15</sup>

PPCF created in previously irradiated area, present a serious problem in tissue reconstruction.

The most commonly used flaps in PPCF reconstruction are muscular and myocutaneous flaps: pektoralis major, deltopectoral flap and/or sternocleidomastoid flap.

In this paper we presented a case of closing of a large postoperative pharyngocutaneous fistula (PPCF) by application of double island pektoralis major myocutaneous flap.

## ***Case study***

In period from 1997 to 2001, at the ENT clinic in Niš, 124 patients have been operated due to malign laryngeal tumor. Out of the total number of operated patients, 17 (13.71%) patients developed pharyngocutaneous fistulas in the postoperative period. All fistulas were developed in patients with total laryngectomy. In 3 (3.72%) patients fistulas were reconstructed with island pektoralis major myocutaneous flaps.

Large PPCF, over 3 cm in diameter, that developed in 5 (6.2%) patients where the surrounding tissue was previously irradiated, were

zračenju, zatvarane su primenom duplog ostrvastog pektoralis major mišićno-kožnog režnja (DOPMMKR).

Bolesnik M. V., star 57 godina, kod koga je sprovedena radioterapija po onkološkom protokolu zbog infiltrativnog planocelularnog karcinoma larinksa, operisan je posle 7 meseci od radioterapije, zbog perzistentnog karcinoma. Kod navedenog bolesnika je urađena totalna laringektomija. Šestog dana posle operacije dolazi do pojave fistule (slika 1) i njenog postepenog uvećanja. Više puta su rađene ekscizije mrtvog tkiva oko fistule (necrectomio), uziman je bris rane i ordinirani antibiotici po antibiogramu. Sve vreme bolesnik je imao nazogastričnu sondu. Po odstranjenju celog devitalizovanog tkiva i smirivanja infekcije 35. dana od pojave fistule pristupili smo operativnom zatvaranju PFKF.



closed by application of double island pectoralis major myocutaneous flaps (DIPMMCF).

Patient M.V., 57 years of age, treated according to oncological protocol with irradiation for infiltrative laryngeal planocellular carcinoma, was surgically treated seven months after radiotherapy due to persistent carcinoma. The patient underwent total laryngectomy. On 6th postoperative day a PPCF was presented (Figure 1) showing gradual enlargement. Excisions of dead tissue around the fistula (necrectomio) were performed on several occasions, smears from the wound were taken, and antibiotics were administered according to antibiogram. During this period the patient had nasogastric suction tube inserted. After the removal of devitalized tissue and the subsiding of infection on the 35th day since the appearance of the fistula, we initiated surgical closure of PPCF.

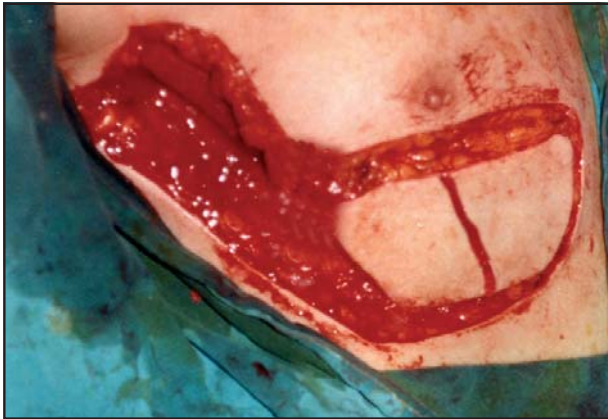
*Slika 1. Post operativna faringokutana fistula posle totalne laringektomije*

*Figure 1. Postoperative pharyngocutaneous fistula occurred of the total laryngectomy*

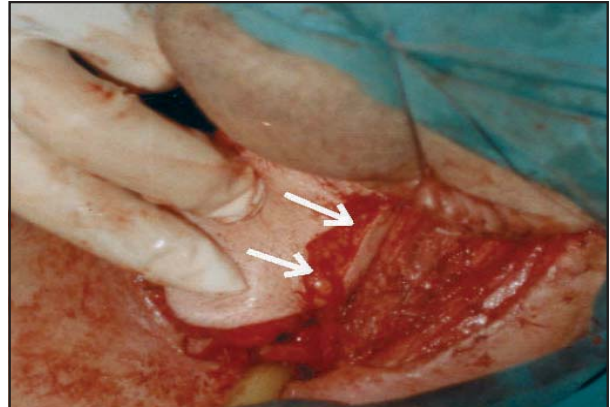
Za rekonstrukciju je upotrebljen DOPMMKR. Režanj je podignut na dugačkoj peteljci iz desne pektoralne regije baziran na pektoralnim granama a.thoraco-acromialis (slika 2).<sup>2</sup> Na mestu gde je režanj presavijen, duž linije preklapanja, urađena je deepitelizacija (slika 3). Rekonstrukcija unutrašnjeg zida fistule urađena je sa, distalnim, mišićno-kožnim delom donjeg sloja presavijenog mišićno kožnog pektoralis major režnja. Deepitelizovana zona i kožni deo gornjeg sloja režnja ušiven je za ivicu prethodno osveženog kožnog defekta na vratu, tako da je fistula zatvorena duplim ostrvastim mišićno-kožnim pektoralis major režnjem (slika 4).

We used DIPMMCF for the reconstruction. The flap was raised on a long stem from right pectoral region based on pectoral branches of a. thoraco-acromialis (Figure 2).<sup>2</sup> We performed deepitalization of the flap where the flap was folded, along the line of the folding (Figure 3).

Reconstruction of inner fistula wall has been performed with distal, myocutaneous part of lower layer of the folded myocutaneous pectoralis major flap. Deepithelized zone and cutaneous part of the upper layer of the flap were sutured to the margin of previously refreshed skin defect on the neck, so that fistula is closed with double island myocutaneous pectoralis major flap (Figure 4).



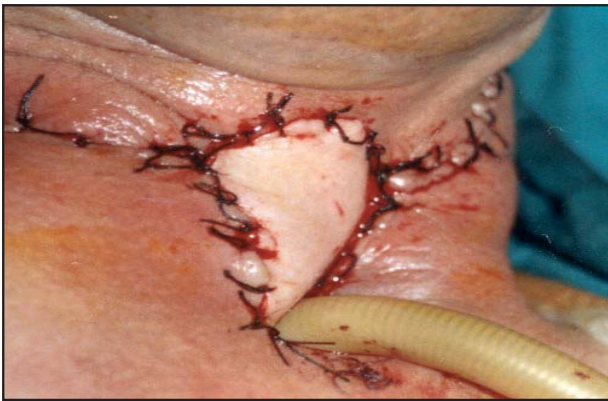
Slika 2. Podizanje DOPMMKR  
Figure 2. Elevation of the DIPMMCF



Slika 3. Deepitelizirani DOPMMKR  
Figure 3. Deepithelialized DIPMMCF

U postoperativnom toku (7. postoperativnog dana), sa leve strane gde je DOPMMKR presavijen, dolazi do njegove nekroze (slika 5). U toku uklanjanja nekrotičnog tkiva (mesec dana posle rekonstrukcije), uočeno je da je donji mišićno-kožni sloj pektoralnog režnja urastao u

In the postoperative period (on the 7th postoperative day), on the left side where DIPMMCF was folded, the necrosis has set in (Figure 5). In the course of removing the necrotic tissue (a month after the reconstruction), we noticed that the lower layer of pectoral tissue has grown into



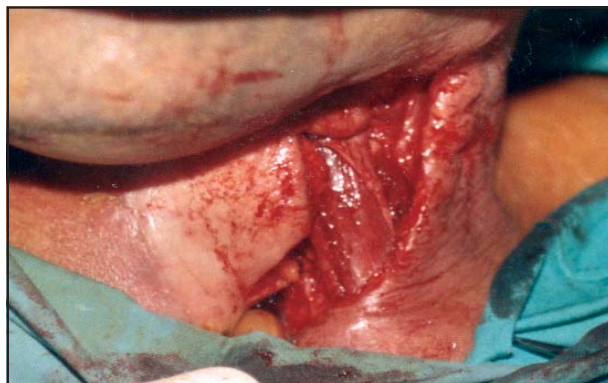
Slika 4. Zatvaranje fistule DOPMMKR  
Figure 4. Reconstruction of fistula by means of DIPMMCF



Slika 5. Parcijalna nekroza DOPMMKR  
Figure 5. Partial necrosis of the DIPMMCF

okolno tkivo, odnosno da je fistula praktično zatvorena a da je odumrla samo leva strana gornjeg sloja režnja (slika 6). Ovaj kožni defekt rekonstruisan je lokalnim kožnim režnjem sa suprotne strane grudnog koša (slika 7).

surrounding tissue, i.e. the fistula was practically closed and only the left side of the upper layer of the flap has died away (Figure 6). This skin defect was reconstructed by means of local skin flap from the opposite side of chest wall (Figure 7).



Slika 6. Nekroza gornjeg dela režnja na mestu preklapanja  
Figure 6. Necrosis of the upper part of the DIPMMCF



Slika 7. Rekonstrukcija sa lokalnim kožnim režnjem  
Figure 7. Reconstruction with local skin flap

## Diskusija

U našoj studiji incidenca PFKF je bila 13,71% dok drugi autori navode incidencu PFKF od 7 do 52%.<sup>3,5,6,9</sup> Zatvaranje velikih PFKF nastalih nakon radioterapije i totalne laringektomije može biti veoma složen problem. Pri njihovom zatvaranju moramo se držati određenih principa kao što su: vreme rekonstrukcije, kontrola infekcije, sukciona drenaža rane, egzaktna hemostaza, nazogastrična sonda, uklanjanje celog devitalizovanog i izmenjenog tkiva iz okoline, odnosno radikalno debridman, rekonstrukcija po slojevima itd.<sup>4,5,7-9,11</sup>

Minimalne fistule prečnika do 1,5 cm, u našoj studiji su se javile kod 6(7,44%) bolesnika i nastale su sedmog do osmog postoperativnog dana od laringektomije; one su spontano zarastale uz adekvatnu toaletu s tim što je bila potrebna vremenski duža primena nazogastrične sonde. Da bi se njihov broj smanjio, smatramo da totalnu laringektomiju treba izvršiti tek posle šest meseci od primenjene radioterapije, ako ovakav postupak nije dao očekivane rezultate. Ovaj naš stav u skladu je sa opšte prihvaćenim stavom drugih autora.<sup>7,9,10,14</sup>

Odabiranje tkiva sa kojim će biti izvedena rekonstrukcija je od posebne važnosti kada se radi o PFKF nastalih kod prethodno radioterapijski tretiranih bolesnika.

Pektoralna regija je najpogodnija zbog svoje blizine kao donorska regija. Najčešće korišćeni režnjevi u rekonstrukciji PFKF su pektoralis major, deltopektoralni i u određenim kliničkim situacijama sternokleidomastoidni režanj.<sup>11,13,16-22</sup> Koji će od ovih režnjeva biti upotrebljen za rekonstrukciju, najčešće zavisi od opšteg zdravstvenog stanja bolesnika, lokalnog nalaza i sposobnosti hirurga. Stepen komplikacija je najmanji pri korišćenju pektoralis major režnja.<sup>11,13,19,20</sup> U nekim slučajevima kod postojanja minimalnih fistula pokazala se uspešna primena fibrinskog lepka u zatvaranju ovakvih fistula<sup>23</sup>.

U našem slučaju, primena DOPMMKR je bila neophodna zbog činjenice da je bila potrebna dvoslojna rekonstrukcija PFKF sa zdravim, dobro prokrvljenim i u dovoljnoj meri dostupnim mišićno-kožnim tkivom. Pektoralis major ima kožni pokrivač veći od 400 cm<sup>2</sup>. Takođe, u odnosu na prethodne pomenute režnjeve, pekto-

## Discussion

In our study the incidence of PPCF was 13,71% while other authors found incidence of PPCF from 7 to 52%.<sup>3,5,6,9</sup> The closure of large PPCF created after radiotherapy and total laryngectomy presents a complex problem. In order to obtain adequate closure we must observe several principles: time of reconstruction, infection control, suction wound drainage, exact hemostasis, nasogastric suction tube, removal of devitalized and altered tissue from the surroundings, meaning radical debridement, as well as reconstruction by layers.<sup>4,5,7-9,11</sup>

Minimal fistulas, 1.5 cm in diameter, were presented in our study in 6 (7.44%) patients on 7th to 8th operative day after the laryngectomy: they spontaneously healed with adequate hygiene but nasogastric tube was applied for a longer period of time. In order to reduce their number, we consider that total laryngectomy should be performed only six months after the application of radiotherapy, if this procedure had not given the desired results. This attitude is in accordance with the attitude of other authors.<sup>7,9,10,14</sup>

The choice of tissue with which the reconstruction will be performed is of special importance when we are dealing with PPCF presented in previously irradiated patients.

Pectoral region is the most suitable for donor region because of its proximity. The most commonly used flaps in PPCF reconstruction are pectoralis major, deltopectoralis and in certain clinical situations sternocleidomastoid flap.<sup>11,13,16-22</sup> Which of these flaps will be used for reconstruction depends mostly on general health of the patient, local findings and surgeon's capabilities. The degree of complications is the smallest when using pectoralis major flap.<sup>11,13,19,20</sup> In some cases when dealing with minimal fistulas, the use of fibrin glue has been efficient for their closing.<sup>23</sup>

In our case, the application of DIPMMCF was necessary because of the fact that we required a double layer reconstruction of PPCF with healthy, well vascularized, and sufficiently available myocutaneous tissue. Pectoralis major has skin cover larger than 400cm<sup>2</sup>. Also, compared to previously mentioned flaps, pectoralis major myocutaneous flap has: an extremely

ralis major mišićno kožni-režanj ima: izuzetno bogatu vaskularizaciju (glavna od a.thoracoacromialis i sekundarna od parasternalnih perforativnih grana a. mammae internae); mogućnost za transfer tkiva bez prethodnog "odlaganja"; dobar luk rotacije režnja; mogućnost da upotrebimo voluminozni režanj; mogućnost da se davajuća regija primarno zatvori; relativno lako podizanje režnja i mogućnost za transfer dva mišićno-kožna ostrva za zatvaranje unutrašnjih i spoljašnjih defekata.

Posle rekonstrukcije PFKF sa DOPMMKR došlo je do delimične dehiscencije i parcijalne nekroze gornjeg sloja režnja. Ova komplikacija nije posledica loše vaskularizacije uzetog režnja, odnosno lošeg planiranja (dimenzija ili oblik) ili način podizanja režnja već zbog nedovoljnog odstranjenja fibroznog tkiva na istoj strani vrata nastalog kao posledica radioterapije. Dokaz za ovu našu tvrdnju je kompletno preživljavanje i urastanje donjeg sloja režnja, koji bi trebalo da teže zarasta jer je distalniji i samim tim na kraju vaskularizacije ovog dela pektoralnog mišićno-kožnog režnja, što se nije dogodilo u prikazanom slučaju.

## Zaključak

- PFKF nastale nakon totalne laringektomije kod prethodno radioterapijski tretiranih bolesnika predstavljaju ozbiljan problem u rekonstruktivnoj hirurgiji.

- Njihovom zbrinjavanju treba pristupiti najmanje šest meseci nakon sprovedene radioterapije.

- Pektoralna regija je izuzetno pogodna kao davajuća regija za režnjeve koji se koriste u rekonstrukciji PFKF.

- Smatramo da je dvoslojna rekonstrukcija duplim ostrvastim pektoralis major mišićno-kožnim režnjem bolja od pektoralis major mišićno-kožnog režnja prekrivenog autotransplantatom kože jer obezbeđuje kvalitetno dvoslojno zatvaranje PFKF a i postoperativna nega režnja je daleko jednostavnija.

good vascularization (main from a.thoracoacromialis and secondary from parasternal perforative branches of a.mammariae interna); possibility for tissue transfer without previous "delay"; good rotational angle of the flap; possibility for the use of a voluminous flap; possibility that the donor region can be primarily closed; relatively easy raising of the flap and possibility for transfer of two myocutaneous islands for closing of inner and outer defects.

After PPCF reconstruction with DIPMMCF there was a partial dehiscence and partial necrosis of the upper layer of the flap. This complication is not the consequence of insufficient vascularization of the taken flap or inadequate planning (dimension or shape) or the manner of raising the flap but rather the consequence of insufficient removal of fibrous tissue created due to radiotherapy, on the same side of the neck. The proof for this statement is a complete survival and growing in of the lower layer which is on the extreme end of the vascularization of this part of pectoral myocutaneous flap, and which had not happened in our case study.

## Conclusion

- PPCF after laryngectomy in previously irradiated patients present a serious reconstructive surgical problem.

- The optimal timing for their treatment is six months after irradiation and adequate wound cleaning.

- Pectoral region is very suitable as a donor area in PPCF reconstruction.

- We consider that double-layer reconstruction with double island pektoralis major myocutaneous flap is better than pektoralis major myocutaneous flap covered by skin autotransplant because it provides a good double-layer closure of PPCF and much easier post-operative management.

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