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Primena balon-katetera u hirurgiji maksilarnog sinusa: prikaz slučaja

Balloon –Catheter Usage in Maxillary Sinus Surgery: Case Report

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PRIKAZ IZ PRAKSE (PP)
CASE REPORT

KRATAK SADRŽAJ

Uvod: *U postoperativnom periodu, posle revizije sluzokože maksilarnog sinusa, potrebno je obezbediti odgovarajuću drenažu i kontrolu mogućeg postoperativnog krvarenja. To se najčešće se izvodi trakom jodoform gaze koja se izvlači kroz privremeno načinjen otvor na sluzokoži forniksa suprotne strane ili kroz trajni otvor u donjem nosnom hodniku.* ***Cilj*** *ovog rada je bio da se prikaže primena balon-katetera radi postoperativne drenaže maksilarnog sinusa i kontrole postoperativnog krvarenja.* ***Prikaz bolesnika:*** *Ovaj postupak je urađen kod osobe ženskog pola, prethodno lečene hemioterapijom, sa prisutnom anemijom i alergijom na jod. Balon-kateter je plasiran u sinusnu šupljinu kroz arteficijelno učinjen otvor u donjem nosnom hodniku, a zatim je primarno zarastanje operativne regije osigurano pojedinačnim i madrac šavovima. Postoperativni tok je protekao uredno. Balon-kateter je uklonjen petog postoperativnog dana.* ***Zaključak:*** *Zapaženo je da primena balon-katetera značajno utiče na kvalitet postoperativnog toka, bez izazivanja postoperativnih komplikacija, i to posebno u rizičnoj grupi pacijenata.*

Ključne reči: maksilarni sinus, balon-kateter, pacijenti rizika

SUMMARY

Introduction**:** *The postoperative drainage and the postoperative bleeding from maxillary sinus cavity have been controled after functional sinus surgery. It has usually been done using the band of iodize gauze squeezed through the temporary opening in the vestibular mucosa or through the inferior meatal antrostomy.* ***The aim*** *of this study was to present the use of balloon-catheter in maxillary sinus surgery intendend for control of postoperative drainage and bleeding.* ***Case report:*** *Balloon-catheter was used in one female who was treated for anaemia after chemotherapy and with allergy to iodine. It was inserted into the sinus cavity through the temporary inferior meatal antrostomy and removed five days after surgery without any postoperative discomforts and complications especially in this risk group of patiens.* ***Conclusion:*** *The balloon-catheter surgery method used in risk group of patients improved the quality of postoperative period without significant complications.*

Key words: maxillary sinus, balloon-catheter, risk group of patients

Oroantralne komunikacije najčešće nastaju prilikom vađenja zuba molarne regije gornje regije. Njihovo neblagovermeno dijagnostikovanje i neadekvatno lečenje dovodi do infekcije sluznice maksilarnog sinusa (1). Istraživanja vezana za ovu problematiku pokazala su da se već posle tri dana kod 50% ispitanika razvija infekcija maksilarnog sinusa koja zahteva primenu hirurškog rada, kako u lečenju stvorene infekcije, tako i otklanjanju formirane oroantralne fistule. (2) Modifikovana, funkcionalna operacija revizije sluznice maksilarnog sinusa jeste jedna od efikasnih hirurških intervencija koja se primenjuje u te svrhe. Imajući u vidu obimnost hirurške intervencije, kao i veličinu operativne regije, za uspeh hirurške intervencije

Oroantral communication most often appears during the extraction tooth in the molar region of the upper jaw. Their late diagnostics and inadequate treatment lead to infection of the maxillary sinus mucous membrane. (1) The researches connected to this problems showed that after three days 50% of the tested have developed infection of maxillary sinus which calls for surgery, either for the treatment of the created infection or for the removal of the oral fistula. (2) Modified, functional surgery of maxillary sinus mucosa revision is one of the efficient surgery interventions, which is used in those purposes. Having in mind the scope of the surgery, and the size of the operative region, for the success of the surgical proceeding

od posebnog je značaja obezbediti adekvatnu postoperativnu drenažu i kontrolu hemostaze, kako u toku operativnog rada, tako i u postoperativnom periodu. (3) Najčešće primenjivan postupak u kontroli hemostaze i postoperativne drenaže jeste primena sterilne trake gaze na koju se nanosi jodoform prah ili antibiotska krema. Tako pripremljna gaza postavlja se u lumen maksilarnog sinusa i izvlači kroz arteficijalno načinjen otvor u donjem nosnom hodniku ili kroz submukozni tunel u vestibulumu suprotne strane gornje vilice. (3) Takođe, u ove svrhe moguće je primeniti i balon-kateter koji ne samo da može obezbediti korektnu hemostazu i drenažu sinusa, (4) već i imobilizaciju koštanih zidova sinusa, (5,6) kada je to neophodno. Cilj ovog rada je bio da se prikaže primena balon-katetera postavljenog u lumen maksilarnog sinusa u cilju postoperativne drenaže maksilarnog sinusa i kontrole postoperativnog krvarenja.

Prikaz bolesnika

Pacijentkinja stara 42 godine primljena je na Kliniku za oralnu hirurgiju Stomatološkog fakulteta u Beogradu radi hirurškog lečenja hroničnog zapaljenja maksilarnog sinusa sa desne strane i oroantralne fistule u predelu bezubog grebena na mestu gornjeg prvog molara. Anamnestički, pacijentkinja je ukazala da se leči od anemije uzrokovane prethodno sprovedenom hemioterapijom, pri čemu je postojala i alergija na jod. Kliničkim i radiografskim pregledom dijagnostikovano je postojanje oroantralne fistule u predelu bezubog grebena na mestu prvog molara u gornjoj vilici izvađenog mesec dana ranije, uz postojanje hronično inflamirane sluznice maksilarnog sinusa sa desne strane. Proba duvanja na nos je bila pozitivna i, uz istovremenu intraoralnu inspekciju prilikom izvođenja ove dijagnostičke metode, bez sekrecije na otvoru fistuloznog kanala. Prednjom rinoskopijom je utvrđena hiperemija nosne sluznice, devijacija nosnog septuma i odsustvo sekreta u nosnoj šupljini. Ispiranjem maksilarnog sinusa 0,9% rastvorom natrijum-hlorida kroz fistulozni kanal, dobijen je bistar sadržaj u nosnoj šupljini, ukazujući na prohodnost prirodonog otvora maksilarnog sinusa. Na osnovu svih dijagnostičkih nalaza odlučeno je da se sprovede modifikovana, funkcionalna operacija revizije sluznice maksilarnog sinusa sa ekscizijom fistule i plastikom novostvorene oroantralne komunikacije primenom klizajućeg mukoperiostalnog režnja sa bukalne strane. Imajući u vidu činjenicu da modifikovana operacija maksilarnog sinusa podrazumeva primenu oralne antrostome u mukozi vestibuluma kroz koju se izvlači jodoform traka radi postoperativne drenaže sinusa. Međutim, kako je u anamnezi pacijentkinja ukazala na alergiju na jod, posle uklanjanja patološki promenjene sluznice maksilarnog sinusa pristupilo se postavljanju balon-katetera u lumen sinusa. Zbog nedostatka originalnog katetera za maksilarni sinus,

especially important is to provide adequate post-operative drainage and haemostasis control, during the surgery work in the post-operative period. (3) The most often procedure used in the haemostasis control and post-operative drainage is the usage of gauze sterile stripes on which it is put iodine powder or antibiotic cream. Such prepared gauze is put in maxillary sinus lumen and pulled through the artificially made opening in the lower nasal tunnel or through sub mucosa tunnel in vestibule on the opposite side of the upper jaw. (3) Also for that purpose it is possible to apply balloon-catheter, which not only provides correct haemostasis and drainage of sinuses (4) but it immobilises bone walls of sinuses, (5,6) when necessary. The aim of this work was to show the usage of a balloon-catheter put in a maxillary sinus lumen with the intent of the post-operative drainage of maxillary sinus and the post-operative bleeding control.

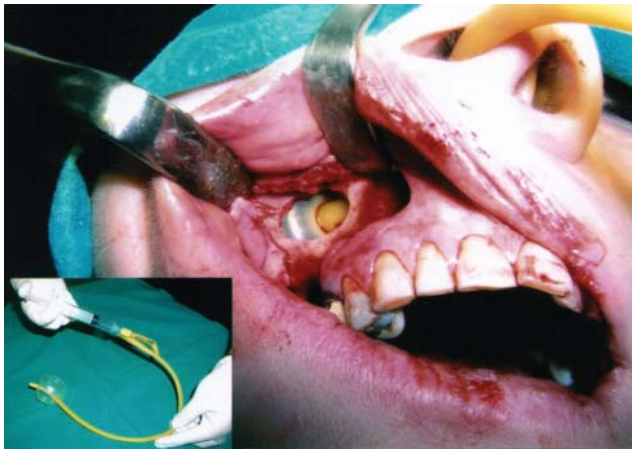
Report of the patient

The patient, a woman, 42, was admitted to the Oral surgery clinic of the College of Dentistry in Belgrade for a surgical treatment of chronic inflammation of maxillary sinus on the right and oro antral fistula in the area of toothless ridge on the place of the upper first molar. In anamneses the patient said that she was treated of anaemia caused by the chemotherapy that had been done before, and there was an allergy to iodine. Clinical and radiography examination diagnosed the existence of oro antral fistula in the toothless ridge area at the place of the first molar in the upper jaw, which had been extracted a month before, and with chronically inflamed mucosa of the right maxillary sinus. The test of blowing the nose was positive, and with simultaneous intra oral inspection during this diagnostic method, and without secretion on the opening of fistula channel. The frontal rhinoscopy the hyperaemia of nasal mucosa was established, the deviation of nasal septum and the absence of secretion in nasal cavity. Rinsing of the maxillary sinus with 0.9% solution of sodium chloride through fistula channel, the clear content was obtained in a nasal cavity, showing the clear passage of the natural maxillary sinus opening. Based on all of these diagnostic findings it was decided to do the modified, functional surgery of maxillary sinus mucosa revision with fistula excision and plastic surgery of newly made oro antral communication using sliding mucous periosteal section from the buccal side. Considering the fact that the modified surgery of maxillary sinus implied the usage of oral antrostomy in a vestibular mucosa through which a iodine stripe for post-operative sinus drainage, and since the patient had the iodine allergy, after the removal of pathologically changed mucosa, into a sinus lumen a balloon-catheter was put. Because of the lack of the original catheter for maxillary sinus, in the case shown balloon-catheter was used. The balloon-catheter was

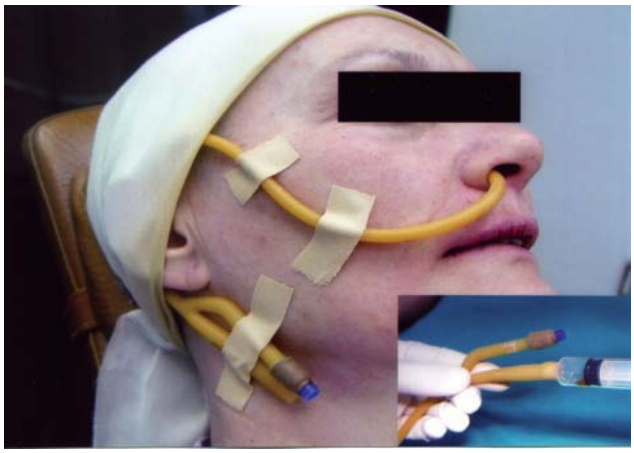
u prikazanom slučaju je korišćen urinarni balon-kateter. Balon-kateter je plasiran u sinusnu šupljinu kroz arteficijalno načinjen otvor u donjem nosnom hodniku (Slika 1). Privremeni nazoantralni otvor bio je prečnika 0,5 cm, kako bi se omogućilo spontano zatvaranje otvora po uklanjanju katetera. Površinski kontakt zidova maksilarnog sinusa i balon-katetera je omogućen ubacivanjem vazduha i naduvavanjem katetera (Slika 2). U postoperativnom periodu, ovako stvoren intiman kontakt površine balona katetera i zidova maksilarnog sinusa omogućio je kontrolu hemostaze. Drenaža nakupljenog sekreta u maksilarnom sinusu je vršena pasivno, preko otvora na kraju katetera u šupljini maksilarnog sinusa, i aktivno, aspiracijom spolja trećeg i petog dana posle hirurške intervencije (Slika 3). Balon-kateter je uklonjen petog dana postoperativno. U postoperativnom opservacionom periodu od sedam dana, pacijentkinji je ordiniran amoksicilin (Amoksicilin®, caps 500 mg, Panfarma, Beograd, SCG) u dnevnoj dozi od 1,5 g, zatim 0,12% rastvor hlorheksidin-diglukonat (Curaden® ADS 212, sol 200 ml, Switzerland) za ispiranje usta i data su uputstva o redovnim kontrolama. Konci su uklonjeni sedmog postoperativnog dana. U ovom opservacionom periodu, pacijentkinja nije ukazivala na subjektivne tegobe, a lokalni ekstraoralni i intraoralni nalaz je bio uobičajen (Slika 4). Operativna regija je zarasla *per primam*.

placed in a sinus cavity through the artificially made opening in the lower nasal hall (picture 1). Temporary nasoantral opening had 0.5cm diameter that enabled spontaneously closed opening after the removal of the catheter. The surface contact of the walls of maxillary sinus and balloon-catheter was enabled with injection of air and blowing up of the balloon (picture 2). During the post-operative period, this way made contact of the walls of maxillary sinus and balloon-catheter enabled the haemostasis control. Drainage of collected secretion in maxillary sinus was done passively, through the opening in the end of the catheter, and actively with the aspiration from the outside on the third and the fifth day after the surgery (picture 3). The balloon-catheter was removed on the fifth day post-operatively. During the post-operative observational period of 7 days, the patient was ordinated with amoxicillyn (Amoxicillyn® , caps 500mg, Panpharma, Belgrade, SMN) in a daily dosage of 1.5gr, then the 0.12% solution of chlorinehexidin-digluconat (Curaden® ADS 212, sol 200ml, Switzerland) was used for mouth rinse and the instructions were given about the regular controls. On the seventh day the threads were removed. During this observational period, the patent didn't show any subjective difficulties, and the local extra-oral and intra-oral findings were usual (picture 4). The operational wound healed *per primam.*

Slika 1. Balon-kateter postavljen u lumen maksilarnog sinusa kroz otvor u donjem nosnom hodniku
Figure 1. Balloon-catheter placed in the lumen of maxillarz sinus throough the aperture in lower nasal spatium



Slika 2. Ubacivanje vazduha i naduvavanjem balon-katetera
Figure 2. Air insertion into the balloon catheter



Slika 3. Pasivna i aktivna drenaža sekreta iz maksilarnog sinusa
Figure 3. Passive and active drainage from the maxillary sinus

Slika 4. Intraoralni nalaz posle uklanjanja balon-katetera (5 postoperativni dan)
Figure 4. Intraoral examination after the removal of balloon-catheter (5th psotoperative day)

Diskusija

Ukazujući na značaj kontrole hemostaze i drenaže operativne regije posle operacije maksilarnog sinusa, u prikazanom radu je primenjen urinarni balon-kateter, koji je postavljen u sinusnu šupljinu kroz privremenu nazalnu antrostomu u donjem nosnom hodniku.

Osim drenaže maksilarnog sinusa, (4) primena balon-katetera je indikovana i u imobilizaciji frakturiranih zidova maksilarnog sinusa (5) i zigomatične kosti6, prilikom hirurških intervencija usled trauma poda orbite (7), kao i drenaži šupljine frontalnog sinusa (8). Komparativna klinička ispitivanja su pokazala da primena balon-katetera omogućava kraći period drenaže (9,10), a samim tim i kraće zadržavanje katetera u operativnoj regiji što smanjuje rizik od kontaminacije katetera mikroorganizmima i mogućnosti pojave postoperativne infekcije (10). U prikazanom slučaju, kraće zadržavanje katetera od pet dana bilo je neohodno jer nije korišćen originalni kateter za drenažu maksilarnog sinusa, već urinarni, nešto veći i nepraktičniji za prisutne uslove. Iako je balon-kateter u šupljini sinusa bio prisutan kraći vremenski period, primenom pasivne drenaže, ali i aktivne drenaže (izvlačenjem akumuliranog sekreta pomoću klasične brizgalice na kontrolnim pregledima), nije dozvoljeno zadržavanje tečnosti u lumenu maksilarnog sinusa, što, svakako, nije slučaj kada se u ove svrhe koristi traka gaze. Naime, sterilna gaza, i to prethodno impregnirana jodoform prahom ima hidrofilni učinak, pa upija i zadržava tečnost u operativnoj regiji. U obzir, svakako, treba uzeti i činjenicu neophodnosti sukcesivnog i bolnog izvlačenja gaze, koja u tom periodu od pet do sedam dana poprima i neprijatan miris. Posebna prednost primene balon-katetera se oglada u intimnom, blagom kontaktu površine balona katetera sa zidovima maksilarnog sinusa čime se kontroliše postoperativna hemostaza, što je bilo od posebnog značaja u prikazanom slučaju zbog prisutne anemije i terapije citostaticima. Klinička ispitivanja Horenblasa i sar. su pokazala odsustvo

Discussion

Showing the importance of the haemostasis control and drainage of the operational region after the maxillary sinus surgery, in the work shown a urinary balloon-catheter was applied, whish was out in the sinus cavity through the temporary nasal antrostomy in the inferior nasal hall.

Except for the drainage of maxillary sinus (4), the application of balloon-catheter was indicated in immobilisation of fractured wall of maxillary sinus (5) and zygomatic bone, during the surgical intervention because of the orbit floor trauma (7), as for the drainage of the frontal sinus cavity (8). Comparative clinical researches showed that, the usage of balloon-catheter enables shorter drainage period (9,10), and along with that, shorter presence of the catheter in operational region, which lessens the risk of contamination of the catheter with micro organisms and the possibility of infection (10). In the case shown, the short catheter preservation for five days was necessary because the original catheter wasn't used for sinus drainage but urinary catheter, which was a little bit bigger and impractical for the presented conditions. Although a balloon-catheter was present in the nasal cavity for a short period of time, applying the passive drainage, but the active drainage, too, (by extraction of accumulated secretion with the help of classic syringe on the control check-ups), it was not allowed to keep the fluid in the maxillary sinus lumen, that, certainly, wasn't the case when a gauze stripe was used in the purpose. Namely, the sterile gauze, previously impregnated with iodine powder has a hydrophilic efficiency, so it absorbs humidity in the operative region. The fact that should be take to consideration is the necessity of successive and painful pulling out of gauze, which, during the period of 5 to 7 days is acquiring an unpleasant smell. Special advantage of a balloon-catheter application is reflected in intimate, a soft contact of the balloon-catheter surface and maxillary sinus walls which controls post-operative haemostasis that was espe-

značajne kompresije ili oštećenja tkiva pri kontaktu sa balonom katetera (11).

U savremenoj oralnohirurškoj praksi, često se postavlja pitanje svrsishodnosti drenaže maksilarnog sinusa kroz otvor u donjem nosnom hodniku posebno iz razloga što je je pod sinusa niži od poda nosa, te se nazalna antrostoma ne nalazi na najnižem mestu sinusa koji se drenira (12). Kako je preparacija arteficijalnog otvora hirurški postupak i zahteva dodatno vreme čime se produžava i trajanje hirurške intervencije (13), uočeni su brojni nedostaci i moguće komplikacije kada je u pitanju postojanje ovog otvora. Naime, ispitivanja na eksperimentalnim životinjama su pokazala da nema značajne razlike u rezultatima histološke analize sluznice maksilarnog sinusa, kao ni u pojavi akutne ili hronične infekcije sinusa bez obzira na to da li je otvor načinjen u donjem ili srednjem nosnom hodniku (14). Analizom kliničkih studija je pokazano da se značajna razlika u postoperativnom periodu ne uočava kako na kliničkim, tako i na radiografskim pregledima kod pacijentata kod kojih je otvor urađen u donjem nosnom hodniku, u odnosu na pacijente sa otvorom u srednjem nosnom hodniku (15,16). Takođe, kliničke studije Duraka i sar. (17) pokazuju da je eliminacija sekreta iz šupljine maksilarnog sinusa usmerena isključivo prema fiziološkom otvoru u srednjem nosnom hodniku, a ne prema načinjenom otvoru u donjem nosnom hodniku, što potvrđuju i ispitivanja Colemana-a i Duncavage-a (18). Isto tako, od značaja je istaći da hirurško pravljenje otvora u donjem nosnom hodniku može da izazove povredu nazolakrimalnog kanala (13) i krvarenje iz sfenopalatinske arterije (19).

Imajući u vidu kritički osvrt na otvaranje sinusa u donjem nosnom hodniku, u prikazanom slučaju je urađen privremeni otvor, manjih dimenzija, čije se zarastanje očekuje po uklanjanju balon-katetera. Budući da je prikazani pacijent zahtevao ozbiljniju postoperativnu opservaciju usled registrovanih anamnestički značajnih oboljenja i alergije na jod, privremenim otvaranje sinusa u donjem nosnom hodniku i postavljanjem balon-katetera vršena je bolja kontrola operativne regije, kao i mogućnost ispiranja sinusa medikamentima u slučaju postoperativnih komplikacija, što bi bilo od posebnog značaja ako se imaju u vidu operacije maksilarnog sinusa kod rizične grupe pacijenta.

cially important in the shown case because of the present anaemia and cytostatic therapy. The clinical researches of Horenblas and associates have shown that the absence of significant compression and tissue damages in the contact with a balloon-catheter (11).

In contemporary oral surgery practice, the question that is often asked is about an appropriateness of maxillary sinus drainage through the artificially made opening in the lower nasal tunnel especially for the reason of the sinus floor which is lower then the nasal floor, so the nasal antrostomy is on the lower place of the drained sinus (12). As the preparation of the artificial opening is a surgery procedure and it demands the additional time, so there are noticed numerous flaws and possible complications when we are talking about the existence of the opening. Namely, the tests on animals showed that there were no significant differences in the results of histology analyses of maxillary sinus mucosa, nor in the appearance of acute or chronic sinus infection, no matter if the opening was made in a lower or middle nasal hall (14). Analysing the clinical studies it was shown that there is no important difference in a post-operative period, either on a clinical nor on radiography checkups of the patient who had an opening made in a lower nasal hall in regard to the patients with an opening made in a middle nasal hall (15,16). Likewise, the clinical studies of Durak and assistants (17) show that the elimination of secretion of the maxillary sinus nasal cavity is directed exclusively towards a physiological opening in a middle nasal hall, and not towards the made opening a lower nasal hall, which was confirmed by the researches of Coleman and Duncavage (18). Similarly, it is important to emphasize that the surgically made opening in a lower nasal hall can cause an injury of nasal lachrymal channel (13) and the bleeding from sphenopalatal artery (19).

Having in mind the critical review on the sinus opening made in a lower nasal hall, in the particular case there was made a temporary opening, which healing was expected after the extraction of a balloon-catheter. In view of the fact that the described patient demanded serious post-operative observation because of the registered anamnestic diseases and iodine allergy, the temporary sinus opening in a lower nasal hall and putting of a balloon-catheter the bettor control of an operative region was provided, and the possibility of sinus rinse with medicaments in the case of post-operative complications, that was specially important if the maxillary sinus surgery in the risky group of patients is considered.

Literatura / References

1. Kretzschmar D, Kretzschmar C, Salem W. Rhinosinusitis: review from a dental perspective.*Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2003; 96: 128-35.
2. Eneroth CM, Martensson G. Closure of antro-alveolar fistulae. *Acta Otolaryngol* 1961; 53: 477.
3. Todorović Lj, Stajčić Z, Petrović V. Povrede sinusa prilikom vađenja zuba. U: Petrović V (ur.). Maksilarni sinus u hirurgiji orofacijalne regije. Zavod za udžbenike i nastavna sredstva, Beograd, 1992: 112-116.
4. Goode RL. An antral catheter for maxillary sinusitis. *Arch Otolaryngol* 1970; 91(6): 603-7.
5. Oppenheimer RP. Treatment of comminuted fractures of the anterior sinus wall. *Trans Am Acad Ophthalmol Otolaryngol* 1975; 80(6): 507-9.
6. Kandalaft G, Neumann-Lezius G, Utz W. Transsinusal repositioning and retention of zygomatic fractures. *Dtsch Zahnarztl Z* 1976; 31(2): 94-6.

7. Gavrić M. Frakture koštanih zidova maksilarnog sinusa. U: Petrović V (ur.). Maksilarni sinus u hirurgiji orofacijalne regije. Zavod za udžbenike i nastavna sredstva, Beograd, 1992: 136-139.
8. Ijaduola TG. Use of a Foley catheter for short-term drainage in frontal sinus surgery. *J Laryngol Otol* 1989; 103(4): 375-8.
9. Gandhi S, Beaumont J, Goldberg R, Kwon C, Abramov Y, Sand P. Foley versus intermittent self-catheterization after transvaginal sling surgery: which works best? *Urology* 2004; 64: 53-57.
10. Carr HA. A short history of the Foley catheter: from hand-made instrument to infection-prevention device. *J Endourol* 2000; 14(1): 5-8.
11. Horenblas S, Kroger R, van Boven E, Meinhardt W, Newling DW. Use of balloon catheters for ureteral occlusion in urinary leakage. *Eur Urol* 2000; 38(5): 613-7.
12. Hamilton WJ, Harrison RJ. Anatomy of nose, nasal cavity and paranasal sinuses. In: Ballantyne J, Graves J (ed): Scott Brown's diseases of ear, nose and throat. Butterworth Co., London, 1971: 231-47.
13. Saito H, Takanami N, Saito T. Studies on the Caldwell-Luc operation with or without counteropening at the inferior meatus. *Otorinolaryngol* 1990; 52: 249.
14. Benninger MS, Kaczor J, Stone C. Natural ostiotomy vs inferior antrostomy in the management of sinusitis: an animal model. *Otolaryngol Head Neck Surg* 1993; 109: 1034.
15. Arnes E, Anke IM, Mair IW. A comparison between middle and inferior meatal antrostomy in the treatment of chronic maxillary sinus infection. *Rhinology* 1985; 23:65.
16. Al-Belasy F. Inferior meatal antrostomy: is it necessarz after radical sinus surgerz through the Caldwell-Luc approach? *J Oral Maxillofac Surg* 2004; 62:559-62.
17. Durak H, Ataman M, Turul H, Gursel B, Hosal N, Bekdik CF. Quantitative 99mTc-DTPA scintigraphy for determination of the maxillary sinus drainage following Caldwell-Luc surgery. *Nuklearmedizin* 1991; 30(5): 178-82.
18. Coleman JR, Duncavage JA. Extended middle meatal antrostomy: the reatment of circular flow. Laryngoscope 1996; 106: 1214.
19. Bingham BJG, Hawthorne MR. Synopsis of operative ENT surgery. Oxford, England, Butterworth-Heinemann Ltd, 1992: 193.

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