HAMMER CHIESEL TECHNIQUE IN ENDOSCOPIC DACRYOCYSTORHINOSTOMY

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Background: *Endoscopic dacryocystorhinostomy (DCR) gained wide acceptance, with a comperable success to external DCR. Removal of sufficient bone over the lacrimal sac in endoscopic DCR is crucial in obtaining a permanent rhinostoma. Several different methods utilized to accomplish this goal.*
Aims: *To describe the technique using hammer-chisel endoscopically for removal of bone over the lacrimal sac. Advantages and shortcomings of this technique were discussed in the light of literature.*
Methods: *Prospective evaluation of endoscopic hammer-chisel DCR performed on 56 eyes of 40 patients with chronic epiphora or dacryocystitis were evaluated (24 unilateral and 16 bilateral, 36 female and 4 male). Hammer-chiesel endoscopic DCR technique included chiesel removal of the bone located over the lacrimal sac. Preoperative intra or postoperative findings and follow-up rewieved and discussed.*
Results: *Follow-up period was 6 to 48 months (mean, 22) postoperatively. Success rate of consecutive endoscopic hammer-chisel DCR was 87.7%. Intraoperatively, 8 cases showing mild mucosal haemorrhage which neither prevented a successful completion of operation. Excellent patient tolerance with minimal morbidity and no major complication was observed.*
Conclusions: *Endoscopic Hammer-chisel DCR is less traumatic and practical with minimal per and postoperative complications. It requires minimal instrumentation and is an easy and fast technique.*

Key words: *Endoscopic, chiesel, dacryocystorhinostomy*

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Endoskopik dakriyosistorinostomide çekiç-keski tekniği

Giriş: *Endoskopik dakriyosistorinostomi (DSR) son zamanlarda eksternal DSR başarı oranlarına yaklaşan bir başarı oranı ile geniş bir kabul gördü. Endoskopik DSR'de kalıcı bir açıklık elde edilebilmesi için lakrimal kese üzerindeki kemiğin yeterince uzaklaştırılması önemlidir.Değişik birkaç metot bu amaç için kullanılmıştır.*
Amaç: *Lakrimal kese üzerindeki kemiği uzaklaştırmak için çekiç-keski metodunu kullanan tekniği tanımlamaktır. Bu tekniğin avantaj ve dezavantajları literatür ışığında tartışıldı.*
Metot: *Kronik epifora ya da dakriyosistitli 40 hastanın 56 gözüne (24 unilateral ve 16 vaka bilateral, 36 kadın ve 4 erkek) uygulanan endoskopik çekiç-keski DSR prospektif olarak değerlendirildi. Çekiç-keski endoskopik DSR tekniği lakrimal kese üzerindeki kemiğin keski ve çekiç kullanılarak uzaklaştırılmasını içermektedir. Preoperatif, inta ve postoperatif bulgular değerlendirildi ve karşılaştırıldı.*
Bulgular: *Postoperatif takip süresi 6 ile 48 ay idi (ortalama, 22 ay). Ardışık endoskopik çekiç-keski DSR'nin başarı oranı %87.7 idi. İntraoperatif olarak 8 vakada hafif mukozal hemoraji gözlendi ancak hiçbiri operasyonun başarı ile tamamlanmasını engellemedi. Minimal morbidite ile birlikte mükemmel bir hasta kompliansı mevcuttu ve majör hiçbir komplikasyon gözlenmedi.*
Sonuç: *Endoskopik çekiç-keski DSR minimal intra ve postoperatif komplikasyonu yanısıra daha az travmatik ve pratik bir yöntemdir. Minimal teçhizatlanma gerektirir , kolay ve hızlı bir tekniktir.*

Anahtar kelimeler: *Endoskopik, keski, dakriyosistorinostomi*

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Endonasal approach first described by Caldwell and later by West[1, 2] in 1893 and 1914. It took half a century to come another endonasal DCR trial[3]. Afterwards several papers appeared in the literature up to mid 80ies[4, 5].

After the eighties, routine use of endoscopic modern telescopes and technological innovations greatly revolutionized our approach to NLD obstruction, and a widespread transnasal[6-19] DCR as well as other sophisticated[20-24] applications were reported in the literature. The nasolacrimal apparatus is easily approached endonasally with endoscopic telescopes without interference with functional pump mechanism of the orbicularis oculi muscle and an external scar with minimal morbidity and complication.

Sufficient endonasal bone removal is the main limitation to this approach. Several techniques utilized to remove the bone located over the lacrimal sac intranasally, such as drilling or laser ablation. In this narrow confined area utilization of the powered instruments carries the potential risk of harming nearby located globe and the brain. Same risk exists for laser ablation whose beam targeted to the globe including expensive instrumentation together with a necessity of extensive personel training to prevent untoward complications to both patient and personnel[16,17,19].

This paper evaluates 56 lacrimal systems which undergone endoscopic DCR technique utilizes hammer-chisel for bone removal located over the lacrimal sac with an easy controllable maneuver.

MATERIALS AND METHODS

Forty patients (56 lacrimal systems) operated endonasally for nasolacrimal obstruction were evaluated prospectively. Cases that six or more months followed included in the study. Resolution of epiphora and an endoscopic confirmation of the ostium patency and free tear drainage is considered as success. Sixteen cases with bilateral and 24 cases with unilateral nasolacrimal canal (NLC) obstruction. Each involved system was considered as separate.

Prospective evaluation and follow-up included

presenting symptoms, predisposing or concomitant paranasal diseases, detailed ENT and ophtalmology examinations preoperatively. Intraoperatively, difficulty to perform hammer-chiesel technique (technical challenge), thickness of the bone over the lacrimal sac, location of the sac related to the middle turbinate, operative time and complications, and postoperatively observation of the rhinostoma site for patency.

There were 36 women and 4 men aged from 17 to 67 years (mean, 35.5). The diagnosis of lacrimal duct obstruction distal to the common canaliculus was made by lipiodol dacryocystography. Predisposing causes were idiopathic in 46 cases, and was accompanied with sinusitis in five, allergic rhinitis in three and traumatic in two cases. In initial evaluation, epiphora was the presenting symptom in 35 of 56 cases (60.4%) and recurrent dacryocystitis in 21 (39.6%).

In preoperative assessment, all patients underwent a complete ophthalmic and ENT examination and the lacrimal obstruction is confirmed by a lacrimal irrigation study. The radiological assessment included lipoidol dacryocystography in all and computerized tomography in 18 cases. Particular attention was paid to intranasal pathologies. Any sign of sinusitis or chronic mucosal inflammation would have required an ethmoidal or middle meatal surgery or an anatomical malformation or variation searched. In addition, significant septal deviation (19 cases) that would give difficulty to reach the sac area intraoperatively and to make postoperative care difficult, has been corrected simultaneously with endoscopic limited septoplasty. In 5 cases with sinusitis, a limited endoscopic ethmoidectomy and middle meatal antrostomy included in the treatment of NLD obstruction simultaneously. Success is defined as resolution of epiphora and chronic dacryocystitis as well as patent irrigation of lacrimal system within 6 months postoperatively.

SURGICAL TECHNIQUE

Under general anesthesia, the nasal cavity is first decongested for 5 minutes with cotton pledgets soaked in topical xylocaine and 0,025% xylomethasine. The lacrimal sac was irrigated

preoperatively with a saline solution and diluted antibiotic solution if it was infected. A light pipe inserted through the puncta served as localizer of the sac intranasally. This area constantly was found to be just anterior or just under the attachment of the middle turbinate, but it was found to be positioned few millimeters posterior in four cases. Then, 1 cm^2 area corresponding to the sac location on the lateral wall of nose is infiltrated 2% xylocaine with 1:100.000 epinephrine. The mucosa is incised with a sickle knife and removed with a blakesley forceps from the lateral nasal wall. Chisel is placed just anterior to maxillary line, the lacrimal bone facing lacrimal sac is fractured and elevated by gently tapping on the chisel by a mallet. Early in our cases, correct identification of the intranasal position of the lacrimal sac was achieved after bone removal from anterior to the anterior attachment of the middle turbinate and then by introducing a lacrimal probe through each canaliculus and gently pushed to see the lacrimal sac tenting is observed while looking through the endoscope. Then, the medial wall of the sac is incised with a sickle knife and excised or the flap slipped inferiorly. Silastic tubes (Lacrimal intubation set, 5013, Visitec, Warks) attached to the stainless steel probes were introduced in each canaliculus and were retrieved under endoscopic visualization. Both ends of the silicone tubes were fastened with a knot and sutured with a 5.0 Prolene to each other and left into nasal vestibule until it is removed. Particular attention is paid to silicone tube to stay loose enough in the region of inner chantus to prevent canalicular laceration. The operation is ended by removing blood clots, and secretions from the nasal cavity. Postoperatively, topical tobramycine drops and broad spectrum systemic oral antibiotics were administered in all cases. The nasal packing only is used if endoscopic septoplasty done simultaneously. If applied, it was removed 48-hours postoperatively. In addition, nasal saline irrigation 4-5 times a day for one week was performed to prevent crusting and to promote good mucosal healing. In the following period, the patient was seen several times for the first fifteen days in the office to remove the accumulated crusts or to treat any granulations endoscopically.

RESULTS

Patients were followed up postoperatively for 6 to 48 months (mean 22 months). Endoscopic DCR was successful in 48 of 56 cases (%87.7). Five cases that referred by an ophthalmologist for revision of the failed external DCR were also included in this study. Complete bony closure was observed with a small pit in the area of previous opening. But the thickness of the reformed bone varied from small bony opening to the thick bone. In several of the cases, becuse of the previous defect endoscopic technique was easily performed on and is found to be superior in revision of the external DCR.

The sac location was constantly observed to be just anterior or under the attachment of the middle turbinate or few millimeters posterior to it. Intraoperatively in 3 earlier cases difficulty in identification of the sac position was observed due to anatomical variation of the middle turbinate. Lately use of endocanalicular light probe gave the exact location of the sac location before opening of the bony window.

In one unilateral case, the irrigation of lacrimal system was patent, the patient had epiphora upon irritation by wind and in cold days only, included in the success group. Tube remained in place longer in earlier cases (4-6 months) but generally was taken out earlier in our recent cases (within 2 to 4 months) according to the patients' compliance and granulation formation at the ostium. There were no intra- or postoperative complications, except mild mucosal haemorrhage which did not preclude the performance of DCR. Gradual constrictive narrowing of the rhinostoma was observed. Three cases needed removal of the granulation tissue around the rhinostoma in the follow-up period. Operative time for hammer-chisel technique was 15 to 105 minutes (mean, 33 min).

DISCUSSION

Dacryocystorhinostomy is the treatment of choice for NLD obstruction distal to the common canaliculus. Over the past several years, minimally invasive surgical techniques have been increasingly applied to a growing number

of surgical specialties. Although endoscopic DCR first described hundred years ago, it gained popularity recently. Numerous technological innovations, especially of endoscopic visualization systems have made this possible.

When compared to external approach, the advantages of intranasal DCR are minimal morbidity, (only to the intranasal rhinostoma opening) and low complication rate, less intra-operative bleeding, shorter operative time. Also it preserves the orbicularis oculi muscle, presaccal fibers and medial canthal tendon and their pump function. It has also a clear cosmetic advantage, which is important for some patients, especially in this female dominant patient group. Endoscopic approach allows also diagnosis and management of the predisposing or concomitant nasal and paranasal sinus disorders which may have influence on the etiology of the NLD obstruction intranasally. In five patients of the present series showed anterior ethmoidal and maxillary disease were treated simultaneously. Because of the minimal morbidity, 16 bilateral cases were operated bilaterally in the same setting with an excellent patient compliance. But, identification of the sac and the difficulty of endonasal bone removal are the main limitations to the endonasal approach.

In endoscopic DCR, laser[7,12-16], rongeur[11,16], drill[16] and chiesel have been used to remove lacrimal bone and the thick bone of the maxilla forming anterior lacrimal crest. However sufficient removal of the thick bone along the anterior edge of the lacrimal sac is important to achieve a permanent lacrimal drainage, since gradual narrowing of the rhinostoma site occurs to some extent during mucousal healing[14,15,16]. The majority of surgical failure occurs between 2 and 6 months[15]. In this study gradual closure of the rhinostoma site occured in 8 eyes between 1 and 2 months.

Utilization of laser for bone removal adds extra cost[9], necessitates sophisticated instrumentation and extensive training, with its related potential complication and hazards to both patient and surgical team[9,16,17]. Bone removal with laser is tedious and has been attributed to the higher recurrences due to small bony opening. Concomitant use of drill or rongeur advocated to

obtain bigger rhinostoma to prevent reclosure[13,14,17]. Also depth of the laser penetration and thermal energy can be unpredictable depending on many factors. Laser beam targeted to the globe is an overt risk and necessitates extra care to prevent any harm to the globe[16,17].

The posterior aspect of the lacrimal bone was thinner and easier to remove than the anterior part, which can be removed with a biting forceps and a bone curet but it necessitates removal of the turbinate resulted in harm to it and afterwards synechia. Thick bone anterior to the attachment of the middle turbinate in an atraumatical fashion is necessary. Contrary will result in scarring, bleeding, and potential risk of injury to the surrounding structures, such as the orbit and the brain. Scarring possibly leads to reclosure of the nasolacrimal fistula and finally surgical failure.

Drilling of the bone over the lacrimal sac is technically challenging first because of the narrow confines of the sac location, and secondarily with a meticulous care is necessary to control a powered instrument. Application in the pediatric patient is complicated in two of the four by nasal vestibule skin abrasion secondary to rotation of the drill shaft.[19] Metson et al[14] stated that drilling could be tedious and result in bleeding. Trauma of the ostium site and its periphery leads to scarring which is one of the major causes of surgical failure[11,13,15,16].

In this study, hammer-chisel endoscopic technique achieved a fast and practical bony removal with little uncomplicated instrumentations. It is also relatively atraumatical with a very simple and a controllable procedure compared to the drilling. Also it is not directed to the globe. The sac location is almost constant and little varability of the sac location was observed. The anterior attachment of the middle turbinate was observed as a very good localiser[9,24].

In endoscopic DCR, prior to opening the presumed sac wall, exact location of the sac intranasally is important to prevent any unwanted damage to the nearby located globe. In order to locate the sac prior to the opening of the medial face of the sac, with endoscopic light

source on the lowest setting, utilization of the 20 gauge endo-illuminator inserted through the puncta made possible to identify the sac before opening. This method even helps to locate exactly where the bony window opened safely. As in our earlier cases, tenting of the medial face of the sac obtained by a probe inserted through the puncta can be utilised if the light pipe is not available.

Epithelial anastomosis and continuous fluid flow are necessary for patent surgical rhinostoma and requires stent placement.[12] A strong relationship with the tube retention and the success is stated also by Boush[15], and others[9,13,24]. Regarding the tube retention there is a wide discrepancy among the authors. Rebeiz et al[24] kept the tubes in place for 4-6 weeks, Kong et al[16] suggested removal of the tube before 8 weeks, to prevent granuloma formation but Haüsler et al[18] kept the tubes in place average nine months and they reported no complication with the tube retention up to three years in several of his cases. We had five failures accompanying two accidental and one intentional premature removal of the tube by patients and one bilateral case operated without tubes NLD obstruction recurred in a month. Now our policy to keep the tube at least two months. This issue needs to be studied further to clarify optimum time for tube removal.

The success rate of our endoscopic DCR results (%87.7) were comparable to external[25-27] and those of previous endoscopic studies, between 80-95%.

Endoscopic hammer-chiesel DCR is recommended as a primary surgery of the NLD obstruction with minimal intraoperative bleeding, short operative time, preserving the lacrimal pump mechanism of the orbicularis oculi muscle, cosmetical convenience with a comparable success rate of endonasal endoscopic DCR to that of external DCR.

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