Combining polydioxanone plate, conchal cartilage interpositional graft and rotation flaps for repair of septal perforation

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Original Article

Abstract

Introduction: Nasal septal perforations repair, especially traumatic ones, is a very challenging subject. A lot of repair procedures had been described in the literature with variable success rates; but mostly not reaching as high as a 94% success rate.

Aim of work: Combining polydioxanone (PDS) plate, conchal cartilage interpositional graft and rotation flaps for repair of septal perforation; how I do it?

Patients and methods: A prospective cohort study of eighteen patients who underwent repair of septal perforation using autologous conchal cartilage graft and PDS flexible plate with nasal mucosal rotational flap.

Results: Complete closure in 94.4%.

Conclusion: Combining conchal cartilage graft with PDS plate, through an external rhinoplasty approach, together with nasal floor mucosal flap covering this cartilage gives high success rates.

1. Introduction

Nasal septal perforation repair is a challenging surgery, not least because of the variety of techniques and graft materials reported in the literature. Autologous tissue is the gold standard generally for nasal reconstruction but can lack the mechanical stability vital for graft integration and consequent successful perforation repair.1

Among the myriad of procedures described in the literature for the surgical closure of nasal septal perforation, the simplicity of the design is elusive. These procedures are technically difficult to perform and hence give unpredictable results.2

Presumed causes for the failure are (A) large perforation with traumatized thin mucosa, (B) no interposition graft in perforation closure with slight tension remaining, and (C) poor blood supply of the flap caused by multiple previous surgeries. An interposition graft affords a template for mucosal migration and minimizes the risk of reperforation when a complete tension-free closure with healthy mucosal flap is not possible.3

The utilization of PDS plate during septal surgery seems to be an applicable method to facilitate external septal surgery, to correct several combined nasal deformities such as posttraumatic and iatrogenic irregularities and it helps to avoid postoperative saddle deformities with certainty, with no risk
whatsoever for the patient. Using the PDS plate in combination with conchal ear cartilage has turned out to be a great advantage, because only with this combination it is possible to create a stable cartilaginous septum with only conchal cartilage.  

The external septorhinoplasty approach has been advocated as it provides excellent exposure, which is crucial for the careful elevation of mucopericondrial flaps, graft insertion, and fixation.

This approach not only provided the needed exposure for large and posteriorly located perforations but also allowed corrective rhinoplasty to be performed simultaneously for cases with associated external nasal deformities.

2. Patients and methods

A prospective cohort study was conducted at the International medical center, Jeddah, Saudi Arabia in the period between 2010 and 2013. Eighteen patients (fifteen males and three females) their age ranging from 24 to 49 years (mean age, 36 years ± 5D) underwent repair of septal perforation using autologous conchal cartilage graft and PDS flexible plate (Ethicon Inc, Johnson & Johnson). All of them had concurrent Rhinoplasty with septal repair. The external approach was chosen to facilitate the dissection, compound graft-PDS plate interposition and Rhinoplasty. All patients had iatrogenic nasal septal perforation after previous septal surgery. Any patients with perforation due to other causes such as systemic disease or substance abuse were excluded. Their chief complaints were nasal obstruction, crusting, and epistaxis. The size of perforation was determined using a flexible ruler, which varied between 0.4 to 2.2 cm in the vertical diameter and 1.2 to 3.7 cm in the longest diameter. Informed consent from all patients was obtained. There is no conflict of interest or any financial disclosure to be made.

3. Timing of operation

Surgical intervention should be done on a healthy mucosa to guarantee satisfactory results. Should the patient have crustations, dryness or recurrent bleeding, he should be treated preoperatively with local nasal irrigation, antibiotic ointments and systemic antibiotic course in severe cases. Instructions are made to avoid local vasoconstrictor sprays. Also it is important to quit smoking for those who smoke.

4. Surgical procedure

4.1. Harvesting the conchal cartilage

Under general anesthesia with controlled hypotension, patients were placed in supine position. For most righthanded surgeons, the right ear is used for the conchal cartilage graft donor site. In other cases with larger perforations, bilateral conchal cartilages were harvested. Local infiltration of both surfaces of the auricle with 1% Xylocaine and 1:100:000 units of epinephrine was done. We used the posterior approach to avoid incisions on the anterior surface of the auricle. We plan the incision site by tattooing across the full thickness of the ear around the conchal fossa. Postauricular incision is performed deep to the perichondrium but not through it, leaving this layer attached to the cartilage. A tattoo guided incision through the cartilage was made, leaving the lateral perichondrium attached to the skin. The conchal cartilage was harvested. Hemostasis was performed carefully with bipolar diathermy. The wound is closed using 6-0 Prolene. We used a tie-over bolster dressing to setback the anterior conchal skin and to prevent auricular hematoma.

4.2. Nasal surgery

After adjusting the patient to a head up (septal surgery) position, Local infiltration of the nose and septum with 1% Xylocaine and 1:100:000 units of epinephrine was done as in routine septorhinoplasty with the addition of the local anesthetic injected into the floor of the nose and underneath the inferior turbinates. Intranasal cottonoids soaked in xylometazoline HCl 0.1% was also helpful for vasoconstriction.

An open approach Rhinoplasty incision was used, starting with inverted V-shaped transcolumnellar incision connected with two longitudinal incisions along the columnellar margin using a no. 11 blade. The skin over the columella was elevated. Sharp dissection was continued using a curved Iris scissors and crossing the soft tissue triangle continues into marginal incisions along the caudal end of the lower lateral cartilages making sure not to incise the underlying crura. Occasionally bleeding occurred from the inferior columellar artery. This usually subsides spontaneously but bipolar cautery under direct vision could be used if needed.

While a Joseph hook is used to pull the columella at the nasal apices caudally to put traction on the columella, combined blunt and sharp scissors dissection was carried superolaterally over the dome and down along the lower lateral crus. Staying directly on the cartilages and bone provides an ideal dissection plane that is relatively avascular. Dissection continued between the medial crura till the caudal end of the nasal septum was reached. Beginning at the anterior septal angle, a strict submucopericondial-submucoperiosteal dissection was completed using Freer elevator to reach the anterior end of the perforation. We turn around the perforation superriorly and inferiorly in the same plane till complete separation of the flaps was achieved. Laterally we extended our dissection over the maxillary crest, inferior tunnel, and under the nasal mucosal floor reaching the root of inferior turbinate.

A longitudinal cut was made by blade no.15 to create the inferoposteriorly based rotation flap.

The incision begins from the anterior edge of the perforation and is extended inferiorly, laterally, and then posteriorly along the lateral wall below the origin of the inferior turbinate. The flap should be few mm larger than the size of the perforation to avoid tension during closure.

The raw bony area on the nasal floor was left for secondary healing.

We mobilize this flap bilaterally to close the mucosal septal defect. The edges of the perforation can now be freshened by removing a small amount of tissue circumferentially. After completing the mobilization of the flaps, we closed the mucosal perforation, on each side using 5/0 Vicryl sutures. Any noted deviation of Vomer, perpendicular plate or cartilage could be corrected. At this stage we dealt with the cartilaginous and bony hump. The cartilaginous hump is reduced using a knife
while we use a Rasp to remove the bony part. Medial, as well as external transverse and lateral osteotomies were made as needed, trying to keep an intact periosteum by dissecting it from the bone prior to fracturing it.

The harvested conchae were cut into pieces and fixed as a compound graft to the PDS plate externally in a fashion that it covers the original location of the septal defect. A 5.0 PDS suture was used for this purpose. Sometimes parts of the remnant posterior septal cartilage are used as completion to serve the same purpose in the case of large perforations after being smoothened, straightened and thinned. Special attention should be paid in reconstruction of the dorsal and caudal septal borders in the case of anterior perforation to create a stable L-shaped anterior septal end.

We inserted the PDS plate with the overlying cartilages between the tension free repaired flaps, making sure that the areas containing the cartilage are placed at the areas of previous perforation. The lower edge of the PDS plate should rest directly on the maxillary crest and sutured to the nasal spine periosteum.

In a case that it is not possible to close the perforation on both sides, at least the cartilaginous containing side has to be completely covered with mucosa to ensure sufficient blood supply. The unclosed side of the mucosa over the PDS plate usually gets well covered within a few weeks. The two septal flaps were sutured with 4.0 Vicryl to bring the flaps and the graft into close approximation and to prevent postoperative hematoma.

Bilateral spreader grafts were fixed in place, and sutured at the upper part of the straightened septum. Then the whole complex was sutured to upper lateral cartilages. The additional value of this step in addition to a better looking cartilaginous vault is to widen the internal nasal valve area and to improve breathing.

Insertion and fixation of a columellar strut between the medial crura in a premaxillary pocket are important and essential to maintain optimum tip projection. Trans-domal sutures were applied.

The transcolumellar incision was closed with an interrupted 6-0 Prolene suture as well as the marginal incisions (see Figs. 1–3).

At the end of the procedure, the hypertrophied inferior turbinates was dealt with using Olympus Celon RFITT (radio frequency induced thermotherapy) applicator for submucosal volume reduction of hyperplasic nasal turbinates. This could be combined with a lateral outfracture in the case of large turbinates obstructing the airway.

Silastic sheets were placed on both sides of the septal mucosa overlying the repair site to ensure mucosal healing, prevent crustations and adhesions. Light gelfoam packing was done without disturbing the bony skeleton. Taping of the nose was done and external nasal (Denver) splint was fixed.

4.3. Postoperative care

Patients are advised to use saline drops to keep the gelfoam wet, the gradual suctioning of it starts at the 3rd post op day. External splints were removed after a week with retaping the nose for another week. This Silastic should remain in place for approximately two weeks after surgery. Patients were instructed to avoid smoking and vasoconstrictor nasal sprays till completion of healing is noticed. The use of saline nasal irrigation and antibacterial ointments could be of benefit in cases of crusting or delayed healing.

5. Results

Eighteen patients were included in this study, 83% were males and 17% were females with a perforation size ranging from 1.2 to 3.7 cm in the longest diameter with an average of 2.3 cm. Seventeen of them had their perforation completely closed (94.4%) with only one failure with the remnant perforation...
Repair of septal perforation poses a significant challenge to the otorhinolaryngologist especially those cases in which the cause of the perforation is a previous surgery. These difficulties come from the fact that there is a considerable amount of tissue loss beside the presence of adhesions which made dissection rather difficult in previously manipulated mucoperichondrial-mucoperichondral flaps. In addition, the uncertain success rate with re-perforation or partial closure leads the surgeons to avoid this kind of operation. Different approaches have been described.

Closed technique with endoscopic assistance, although it reported a high success rate, it is extremely difficult, especially in large perforations or in patients with small nostrils. Open-external approach has many advantages, in that it allows access to the anterior, superior, and posterior aspects of the perforation and not only increases surgical exposure but also provides a field without the distortion that normal intranasal retraction causes. The external approach gives the surgeon excellent binocular vision and furthermore allows the assistant to retract so that the surgeon can use both his hands simultaneously.

Other authors combined septal perforation repair with Rhinoplasty as combining the two techniques did not compromise the perforation repair. On the contrary, some of the Rhinoplasty maneuvers that are used proved to be very helpful in the process of septal perforation repair.

Although the classical septoplasty technique itself has undergone several modifications, it was very difficult to reach a permanent straight septum in severely deviated septum. The external axis of the nose was never corrected. The external deviation of the nose remained unchanged.

This adds another benefit to the external approach, to do osteotomies and insert spreader grafts to correct a crooked nose and straighten a previously poorly corrected septum.

As all our patients suffered from post septal surgery perforation with a subsequent one or a combination of dorsal saddling, tip drop, and columnellar retraction, our choice was to combine the repair with rhinoplasty to achieve both functional and esthetic patient satisfaction.

The highest success rates of septal perforation were recorded when interposition grafts were used, up to 90%.

In addition to using cartilage interposition grafts, the utilization of the PDS plate during septal surgery seems to be an applicable method to facilitate external septal surgery, to correct several combined nasal deformities such as posttraumatic and iatrogenic irregularities and it helps to avoid postoperative saddle deformities with certainty, with no risk whatsoever to the patient.

Based on the above and in attempt to maximize our success rates, we combined the conchal cartilage graft with the PDS plate, through an external Rhinoplasty approach. Covering this cartilage with mucosal flap from the nasal floor with individual adaptation of the size of the mucosal flap to the perforation to establish sufficient blood supply to it added to its survival and hence the success of the technique. Using this combination achieved a success rate of 94.4% with one case of re-perforation.

Combining reasons of success such as interposition cartilage grafts, PDS plate and rotation flaps through an external rhinoplasty approach can achieve high success rates in the repair of nasal septal perforation. Although time consuming and technically demanding, we think it is worthy to use every tool in our armamentarium to overcome the failures usually encountered in such an operation.

References


