ORIGINAL ARTICLE

Journal of Otorhinolaryngology and Facial Plastic Surgery 2019;5(3):1-6.

https://doi.org/10.22037/orlfps.v5i3.29775

The Influence of PDS in Patients under Septoplastic Surgery

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Article Info

Article Note:
Received: August, 2019
Accepted: September, 2019
Publish Online: September, 2019

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Keywords:
Deviation;
Polydioxanone plate;
Septal;
Septoplasty.

Abstract

Background: It is a well-known fact that deviation of bony or cartilaginous septum can induce airway obstruction. Therefore, fixing the deviated part in a refined and straight line is one of the substantial challenges in otolaryngology. There are huge varieties of methods to eliminate this deviation.

Aim: In this study, we desire to assess the efficiency of polydioxanone plate (PDS), fixed to the cartilage of nasal septum, to determine the mechanical safety over septoplasty, as the components of cartilage had been healed.

Methods: In the following study, 48 patients with septal deviation, referring to an academic hospital in Iran for one year, were investigated. They underwent external and endoscopic septoplasty combined with the polydioxanone plate. The data was gathered in a questionnaire including the deviation of nasal septum, infection, septal hematoma, saddle nose, columella retraction and polly beak deformity.

Results: Due to the septal injury resulted from trauma, a total of 27.1% patients was transferred to our hospital. Our results showed the cause and type of septal deviation had no effect on surgical results ($p = 0.3$), and acute complications were observed in only two patients (4.2%). After 3-6 months of follow up, 5 patients (10.42%) had long-term complications, while satisfactory results were obtained in 39 subjects (83%).

Conclusion: Absorbable plate, polydioxanone, connected to cartilage was found safe and effective. It could facilitate the modification rates of surgical processes in septal deviation and had the ability to support the nasal dorsum till it gradually get recovered, without the long-term complications occurring in other techniques.

Conflicts of Interest: The Authors declare no conflicts of interest.
Please cite this article as: Soroureddin Z, Shiravand S, Khoshsirat S. The Influence of PDS in Patients under Septoplastic Surgery. J Otorhinolaryngol Facial Plast Surg 2019;5(3):1-6.
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Introduction

The nasal septum is a midline and straight structure to support the nose's shape and structure, however, it can become deviated (1, 2). Traumatic and congenital septal deviation is characterized by various factors such as location (posterior, antrosuperior, caudal) and severity (mild, moderate, and severe).

Data published by North America and Europe centers indicate an average rate of 1.2 cases per 1000 for the nasal septal surgery. These septal surgeries are routine in 90% of subjects, while the rest necessitates the complex modification. Accordingly, it seems that external septoplasty can be a useful solution for these patients. The reconstruction of septum by extracorporeal technique is believed to take much time which technically would be a difficult task to carry out. There seems to be the risk of cartilage fragments overlapping which leads to postoperative saddle nose deformity, even when this procedure done by

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special surgeons. For such reasons, external septoplasty has been recommended by several authors for severe septal deformity cases (3, 4) There are varieties of techniques for septal deviation. Killian 5 described submucousus resection technique in 1905 for the first time which became well-known over the time, while the resection of important parts of a septum including the blades of mucous membrane resulted in problems and complications such as perforation of the septum. Septoplasty is another method for correcting the nasal septum, which was accepted as the standard practice for several decades. Conventional septoplasty cannot always guarantee a nasal septum straightening; because the surgical manipulations lose the nasal septal cartilage mechanically.6 Nasal reconstruction surgeries necessitate multipurpose surgical instrument which are able to be modified to meet different clinical conditions. Numerous alloplastic materials have been investigated including cork, paraffin, ivory, gold, and silver (7). These early implants have some problems such as infection and extrusion, which eliminate the success rate of these implants. Polydioxanone, as a colorless crystalline and flexible Plate, is recently used extensively. This degradable, unperforated implant can be absorbed completely (this feature is more prominent than other implants). In addition, this type of implant is available in various sizes and thicknesses; perforated thickness with the size of 0.15 mm, and unperforated thickness with different sizes of 0.25 mm and 0.55 mm. Although they are flexible, they have the potential to preserve their own shapes. They are readily able to be fixed to the cartilage by sutures without any sign of fibrous scar tissue. It supports the graft pieces and nasal structure, and prevents the overlap and bending (8, 9) One of these types, which is perforated, can be used for the variety of anatomical and surgical conditions, and are able to minimize the chance of additional cartilage graft. They also make some benefits such as columellar struts, septal extension grafts, alar battens, and upper lateral replacement grafts (10, 11, 12)

Methods

In this clinical study, we selected 48 patients who underwent septoplasty using polydiaxonone. We evaluated the hospital admission records and postoperative examination data. Data was recorded in a questionnaire by the surgeons. The inclusion criteria for our study included above 18 years old peoples with a deviation of nasal septum. Informed consent for nasal septoplasty with photographic documentation was obtained from the patients or their parents/guardians in all cases. After septoplasty, using PDS foil for the reconstruction of septal deviation was essential. During the hospitalization, the patients were monitored daily by a specialist. The acute complications (infection and septal hematoma) were checked and recorded. 3-6 months after surgery, the patients were examined again by the surgeon to assess the long-term complications (Saddle Deformity, Columella Retraction, Polly beak Deformity). A satisfactory result was obtained according to the subjective opinion of both surgeon and patients, surgical complications, recovery period and the functional and aesthetic outcomes.

We analyzed the data using SPSS 18, in terms of frequency, the average and standard deviation for the quantitative variables. The statistical assessments were performed using Fisher, Chi-Square test and T-test for quantitative variables.

Techniques

Based on the type of the deviation and endoscopic or external procedure, we performed different methods. But, overall, after general anesthesia or intravenous sedation, the patients were placed appropriately in a standard position. The external nose and internal nasal septum underwent local anesthesia using

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xylocaine1% with epinephrine1:100:000. Following the epidermis and soft tissue decollement, septal cartilage on one side was detached and completely demolished. The separated cartilage was utilized as a sample for the incision of foil and was put on the foil. To clarify the precisely corrected size of the septum, the outline of cartilage, which had been separated, was replicated to the PDS foil. In order to segregate the deviated cartilage into the straight slices, the foil was slitted along with the detected line. These fragmentations were arranged upon the foil. By using a general amount of 6/0 PDS suture materials, they were stitched to the foil. After the modification of deformities into the ventricle plate and vomer, the reconstructed site of the septum was mixed with the PDS foil. Finally, the skin incision was closed with nylon 6.0.

Results

In this study, 48 patients with a mean age of 32.5 years (SD ± 8.3), included 26 males (54.2%) with a mean age of 34.0 (SD ± 8.8) and 22 females with a mean age of 30.6 years (SD ± 7.3) were evaluated during one year (Table 1). Gender and age have no significant effect on our results using this type of surgery. In our study population, 13 cases (27.1%) were referred to the hospital because of septal injury result from trauma, and 53.9% were males. The majority of septal deviated subjects were congenital. Meanwhile, the septal deviation pursuant to trauma in the males group was more than females. The cause and type of septal deviation had no significant effect on the surgical results (p =0.3). External surgery was performed in 43 patients (89.6%), which had a 90.7% satisfactory. Only 10.4% of surgeries were endonasal. In 17 subjects (35.4%), the flap was replaced by a unilateral suture, while bilateral suture was applied in 31 cases (64.6%). In 29 patients (60,4%), vomer was removed during the surgeries. Except for the statistical relationship between methods of surgery and results (p=0.002), other variables had no significant effect on surgery. Complications were studied separately in two groups including acute (during the first 2 weeks of surgery) and long-term (after 2 weeks from the operation). As an acute complication, mild bleeding was seen in only two patients (4.2%). There was not any case of hematopoietic septum or infection in the first two weeks after surgery.During 3-6 months follow up; long-term complications were recorded in 5 cases. Acute complications had no considerable effect on the results of surgery (Table 2).

Table 1: Gender frequency of Traumatic septal deviation and congenital septal deviation

Gender	Traumatic septal deviation	Congenital septal deviation
male	7(26.9%)	19(73.1%)
female	6(27.3%)	16(72.7%)
total	13(27.1%)	35(72.9%)

Table 2: Frequency of complications among patients

Complication	Number	Percent
Acute Bleeding	2	4.20%
Saddle Deformity	2	4.20%
Columella Retraction	2	4.20%
Polly beak Deformity	1	2.10%

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Finally, considering the surgical complications and satisfactory rates of patients and surgeons, the satisfaction of this method was calculated 83/3%, and in 56% of patients, the satisfaction degree was excellent (Figure 1).

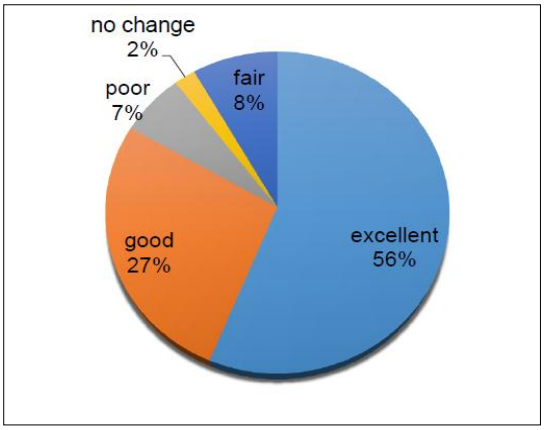

Figure 1. The frequency of satisfaction among patients.

Discussion

Alloplastic implants are well-known for their mechanical stability which can be used as supporting materials for cartilage. Rhinoplasty implants prevent long-term complications (13). They are mandatory to use during the healing of the supporting tissue and are completely absorbable after a short period.

Applying the absorbable polydioxanone foil facilitates the septal reconstruction surgical procedure. In this method, trimmed nasal septal cartilage chips are sutured in order to resorbable polydioxanone foil, making a straight and stable free graft which can fix the cartilage fragments. They can also support the nasal dorsum till the recovery process leads to the fixation of cartilage. Afterwards, the polydioxanone foil is resorbed, which prevents long-term complications. An examination on overall biological features of polydioxanone implantation in the process of bone improvement proved that14 the degradation products of the synthetic aliphatic polymer stimulated the osteoconductive bone traits and did not interpose with the usual recovery approaches.

Results suggested that an absorbable plate is an effective and a safely stabilized autologous graft. The current research is trying to validate the long-standing satisfactory rates by using PDS in septorhinoplasty. Therefore, nasal septal cartilage together with resorbable polydioxanone plate provide technical benefits over the surgery, after the operation and during the recovery by an absorbable implant (15). In 1952 King and Ashley described extracorporeal septoplasty with an overall good result. Gubish study on 459 patients, who underwent the operation for 23 years, showed the rates of performance in 96% of subjects were good or/and excellent. They also reported a complication percentage of 12%. Dorsal irregularities and saddle deformities were noted as the particular complications in their study (16).

Although many studies reported desirable functional and cosmetic outcomes in most cases, several investigations have indicated different results inconsistent with our results (17, 18). The thickening of the nasal septum for the first weeks of surgery was an issue in some studies which completely has been addressed in all patients. Subluxation at the caudal border have been also reported as the surgical complication in some studies (19, 20)

In one research, the application of absorbable plates to secure Caudal Septal Extension Grafts resulted in statistically significant improvement categorized in 5 factors such as congestion, blockage or obstruction, breathing through the nose, trouble sleeping and breathing during exercise. Functionally, it can be concluded that absorbable plates might be used in septorhinoplasty to secure Caudal Septal Extension Grafts without any obstruction (21). The result was almost the same as our research, which reported that 4.2% had bleeding as an acute complication and respectively 4.2%, 4.2% and 2.1% had saddle nose, Columella Retraction, and Polly beak Deformity as the long term complications.

To improve severe forms of abnormalities especially post traumatic, deformities of the

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nasal septum, several authors recommended external septoplasty (22, 23).

An animal study on 71 cases with severe septal deformities, which investigated the histological aspects of septoplasty with polydioxanone, proved that the PDS foil would remain unchanged for at least 10 weeks and would be completely reabsorbed after 25 weeks. The results also showed the minimal scar tissue in that procedure, without any report of acute or long-term complications.

The PDS plate is histologically useful for tissue regeneration to produce more mature cartilage, and mature cartilage which contributes to a better shape of complete plate of cartilage. In one series, several saddle deformities were seen following the application of unperforated foil.

For the minimum of 10 weeks after surgery, resorption of the PDS plate does not start. The unperforated foil tends to sit between the septal cartilage and its own perichondrium. Lack of blood supply to improve septal cartilage causes septal collapse. The contact between the cartilage and plate in perforated foil let the cartilage to preserve its blood supply through the plate. In our study, we did not compare perforated and unperforated foil. Therefore, further examination is required.

Conclusion

As a safe and effective technique, absorbable plates can make the intricately functional and cosmetic nasal reconstruction much easier than that in the past. In fact, this technique has the ability to provide a structural template within which it will be easier to connect cartilage, even in the small sizes resulting in an effortless insertion of such grafts into the nose. By performing such methods, the percentage of post-surgical drawbacks will decrease in the future, and due to the fully absorbable feature over 25 weeks, the long-term unfavorable outcomes of a synthetic graft substance are prohibited.

Acknowledgments

We thank Hearing Loghman Hospital and Medicine School of Shahid Beheshti University, Tehran, Iran for granting us.

Conflicts of Interest

The authors declare no conflicts of interest.

Ethics:

This study was approved by the ethics committee of Hearing Disorders Research Center, Shahid Beheshti University and Loghman Hospital, Tehran, Iran. All participants granted consent prior to taking the survey. Participation in this study was completely voluntary, and participants could decide to withdraw from the survey at any time. No personal or identifiable information was collected.
IR.SBMU.RETECH.REC.1398.459

Financial Support

This work was supported by the Medical School of Shahid Beheshti University and Hearing Disorders Research Center of Shahid Beheshti University and Loghman Hospital in Tehran, Iran.

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