

EXTRACORPOREAL SEPTOPLASTY USING POLYDIOXANONE PLATES v/s CONVENTIONAL SEPTOPLASTY IN MANAGEMENT OF DIFFICULT SEPTUML. Somu¹, Prasanna Kumar Saravanam², A. Ravi Kumar³, Urvashi S⁴, Prem Nivas⁵, Gokul Anand M. S⁶**HOW TO CITE THIS ARTICLE:**

L. Somu, Prasanna Kumar Saravanam, A. Ravi Kumar, Urvashi S, Prem Nivas, Gokul Anand M. S. "Extracorporeal Septoplasty Using Polydioxanone Plates v/s. Conventional Septoplasty in Management of Difficult Septum". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 73, September 10; Page: 12742-12753, DOI: 10.14260/jemds/2015/1835

ABSTRACT: BACKGROUND: The technique and management of deviated nasal septum has evolved over the last few centuries. However, difficult and severely deviated septum still poses a surgical challenge. Difficult septum is characterized by severe malformations of cartilaginous, bony or both components, with significant airway block. Extracorporeal septoplasty with reconstruction with polydioxanone plates can be recommended as a viable alternative to conventional methods in management of such difficult septum. **OBJECTIVE:** To assess the clinical results and functional outcome of extracorporeal decortication septoplasty using polydioxanone (PDS) plate and compare the outcome with conventional septoplasty. **METHODS:** This is a prospective study of 60 patients who were managed by extracorporeal decortication septoplasty using PDS plates and conventional septoplasty. Preoperative and postoperative subjective assessment in the form of 'Nasal Outcome and Septoplasty Effectiveness scale' (NOSE score) and a modified 'Sinonasal Outcome Test' (SNOT score) was done. Patients were followed up using diagnostic nasal endoscopy. The functional outcome and complications were assessed. **RESULTS:** In our study we found a statistically significant reduction between preoperative and postoperative score in patients who underwent extra-corporeal decortication septoplasty using PDS plate when compared to the results of those who underwent conventional septoplasty with a p- value of 0.000.

CONCLUSION: Extracorporeal decortication septoplasty can be recommended as a suitable alternate in the management of difficult septum where conventional septoplasty may fail to achieve a good functional outcome.

KEYWORDS: Septoplasty, Extracorporeal, Polydioxanone, SNOT score, NOSE score.

INTRODUCTION: Nasal septum has a decisive influence on the form and function of the nose. Deviations of the nasal septum lead to nasal obstruction and alteration the normal physiology of the nose. Septoplasty is a surgical procedure done to correct such deviations. Septoplasty has been an evolving technique over the last few centuries; from crude methods like digital pressure employed by Quelmatz way back in 1757 to the blunt fracturing of nasal septum that was practiced in the 19th century.^{1,2} 'Extracorporeal septoplasty' as described by Gubisch in 1995 has failed to correct a difficult nasal septum because the deformed nasal septal cartilage had to be segmented into several smaller sections.³ This method was not only technically complex but also time consuming as the quadrangular septal cartilage is difficult to stitch from end to end. Furthermore, overlapping of the cartilaginous sections may occur which could lead to thickening of the nasal septum.

Gubisch, later introduced the use of polydioxanone plates in extracorporeal septoplasty.³ Polydioxanone seemed advantageous to support divided cartilage fragments as it is completely resorbed by the body to avoid long term complications caused by alloplastic graft materials.

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In this study we compare the effectiveness of polydioxanone plate in extracorporeal decortication septoplasty with conventional septoplasty.

PATIENT SELECTION AND METHODS: This was a prospective, single blinded, case-control study conducted at a Tertiary Referral University Hospital for a period of 2 years from June 2012 to June 2014. A total of 60 patients were included in the study after randomly being allocated into group A and group B. Group A underwent extracorporeal decortication septoplasty using PDS plate while group B underwent conventional septoplasty.

All patients with deviated nasal septum/septal spur causing nasal obstruction with or without external nasal deformity between the age group of 18 to 60 years were included in the study.

Patients below the age of 18 years were excluded as septoplasty has been found to be controversial in pediatric population and patients above age 60 years were excluded due to presence of multiple comorbidities that could alter tissue healing rate. Patients with chronic sinusitis and adenoid hypertrophy were excluded, hence isolating deviation of the septum as the only causative factor for the aforementioned symptoms. Patients with diabetes mellitus, renal disease, coagulopathy, and of immunocompromised state were all excluded from the study due to the possibility of delayed tissue healing rate.

Nasal surgery alters the anatomy as well as the physiology of the nose. Hence patients with history of previous nasal surgeries were excluded from the study.

Subjective assessment was done for all patients in the form of Nasal Outcome and Septoplasty Effectiveness scale (NOSE score) and a modified Sinonasal Outcome Test (SNOT score).

NOSE score comprises 5 questions, each with a score of 0 to 4.⁴ the patients were asked to circle the response closest to describing their current symptom and its severity (Table 1). The sum of the scores of each question was calculated and multiplied by 5 to get the NOSE score for that particular patient. The maximum score obtainable would be 100 and minimum 0.

A modified SNOT score was also used as a subjective assessment. SNOT score comprises of 20 questions used to assess all symptoms of nasal disease.⁵ in this study we had taken 5 questions of the 20 that best suited the symptoms of deviated nasal septum. Patient rated the severity of their condition on each of the 5 items using a 0-5 scoring system. The average of the 5 questions was taken as the final modified SNOT score (Table 2).

All patients were then assessed by anterior rhinoscopic examination by a senior faculty in the outpatient department for the following:

- A. Side of deviation of the nasal septum.
- B. Presence/absence of compensatory inferior turbinate hypertrophy.
- C. Presence/absence of nasal discharge.
- D. Congenital malformations.

Diagnostic nasal endoscopy was done to assess the degree of nasal deviation and to rule out chronic sinusitis as well as adenoid hypertrophy. The deviated septum was classified into mild, moderate and severe (Table 3).⁶ The classification quoted above was applied to our patients. Patients with mild deviation were given a score of 1, moderate deviation 2 and severe deviation were given a score of 3.

SURGICAL PROCEDURE:

Extracorporeal Decortication Septoplasty using PDS Plate: Surgery was done under general anesthesia. Infiltration of xylocaine (2%) with adrenaline (1:200000) was given submucosally on both sides of the septum. Freer's incision followed by submucoperichondrial dissection to expose the caudal edge of the cartilaginous septum was done. Subperichondrial and periosteal flaps were elevated on either side of the septum. The septal cartilage was detached from the maxillary crest and vomer. The septal cartilage was completely freed and removed as a single piece. Septal cartilage was placed on the polydioxanone plate, and the outline of the removed cartilage was drawn on the polydioxanone plate to determine the exact size of the nasal septum to be reconstructed. The polydioxanone plate was cut along the marked outline, and the deviated cartilage was separated and cut into straight fragments (Figure 1 & 2).

After all of the fragments were satisfactorily rearranged and sutured to the polydioxanone plate using 3-0 polydioxanone suture material (Figure 3 & 4). The nasal septum combined with polydioxanone plate, was placed between the two layers of septal mucoperichondrium (Figure 5) and adjusted to the correct position. A series of continuous trans-septal through-and-through sutures were positioned to fix the septal flaps, thereby closing all dead space and firmly stabilizing the septal component. Anterior nasal packing was done and left in-situ for 24 hours.

Conventional Septoplasty: Similar procedure was followed except that in this case the most deviated part of the bony septum was removed. Inferior strip of cartilaginous septum along the floor was removed. Maxillary crest was gouged out in case of a septal spur. Flap was repositioned. Wound was closed using 3-0 vicryl after obtaining haemostasis.

The Intra-operative time in minutes was noted from the time of initiating infiltration of local anaesthetic agent to the time the last suture was completed in both groups.

All patients were administered the same post-operative drug medication. Patients were discharged from hospital 48 hours after surgery and reviewed at 1st week, 3rd week, 12th week and 24th week post-operatively. Anterior rhinoscopy and diagnostic nasal endoscopy recordings were done to assess post-operative complications if any. During the 6th month follow up, a post-operative NOSE scoring and modified SNOT scoring were done.

Statistical Analysis: All scores were tabulated and analysed using SPSS software with a student-t test and Mann-Whitney U test. The p value was calculated and the results analysed.

RESULTS: Patients in Group A underwent extracorporeal decortication septoplasty using PDS plate and patients in group B underwent conventional septoplasty. Both groups were assessed by applying study criteria and the results are as follows:

PREOPERATIVE ASSESSMENT:

Preoperative Anterior Rhinoscopic Examination:

During the initial anterior rhinoscopic assessment majority of the patients in group A had deviated cartilaginous septum to the left of which one patient had an associated caudal dislocation.

One patient was operated for a crooked nose deformity. Three patients had S shaped deviated septum and 11 patients had a deviation to the right (Table 4). In Group B majority of the patients had deviated septum to the right while 11 patients had a deviated nasal septum to the left and seven had an S shaped deviation of the septum (Table 4).

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Pre-operative NOSE and modified SNOT scoring: Student-t test and Mann-Whitney U test was used to find the level of significance. Table 5 & 6, respectively shows pre-operative modified SNOT scoring and NOSE scoring of all the patients in group A and group B. The mean NOSE score in group a patients were 71.83 ± 22.42 and the mean in Group B were 75.50 ± 12.69 as shown in Figure 6.1. The mean modified SNOT score for group a patients were 1.927 ± 0.68 and the mean for group B were 2.117 ± 0.45 as shown in Figure 6.2.

Intra-Operative Assessment: The average duration of surgery in group A was 65 minutes and that of Group B was 44 minutes. The longest time taken in group A was 100 minutes and in Group B was 50 minutes. Duration of surgery was significantly high in Group a when compared to Group B with a statistically significant p value of 0.000.

POST-OPERATIVE ASSESSMENT:

SNOT score:

The mean post-operative modified SNOT score for group a patients were 0.307 ± 0.22 and for group B were 0.840 ± 0.43 (Figure 7).

There was a decrease in the SNOT scoring in both groups post operatively. The average SNOT score in Group A being 1.927 ± 0.68 pre-operatively and 0.307 ± 0.22 post-operatively and group B patients being 2.117 ± 0.45 pre-operatively and 0.840 ± 0.43 post-operatively (Table 5 & Figure 8). However, there is a greater decrease in Group a when compared to Group B which is statistically significant with p value of 0.000.

NOSE score: The mean NOSE score post-operatively for group A patients were 9.33 ± 6.40 and for group B patients were 20.33 ± 11.30 (Figure 9). The NOSE scoring shows a decrease in the post-operative scores. Group A patients had a pre-operative score of 71.83 ± 22.42 and post-operative score of 9.33 ± 6.40 . Group B patients had a pre-operative score of 75.50 ± 12.69 and a post-operative score of 20.33 ± 11.30 (Table 6 and Figure 10). As with the SNOT score, the difference between the post-operative scores between Group A and Group B shows a greater difference in Group A when compared to Group B with a statistically significant p value of 0.000.

DISCUSSION: The first documented correction of the deviated nasal septum dates back to 1757 when Quelmatz recommended daily digital pressure to the septum for a gradual correction.¹ However the first surgical method was not attempted until 1875 when Adams had described the practice of blunt fracturing and splinting of the nasal septum.² Freer and Killian developed the foundation of modern septoplasty techniques by introducing submucosal resection.^{7,8} Later Cottle recognized the disadvantages of submucosal resection and favored a more conservative approach by septoplasty with repositioning and removing minimal bone and cartilage.⁹⁻¹¹

However, over the years it was noted that septoplasty alone was not always adequate in correcting severe nasal septal deformities. In 1950s King, Ashley and Perret suggested that the entire septum should be removed, corrected and repositioned to correct a markedly deviated septum.^{12,13} Thus the technique of extracorporeal septoplasty came into vogue. Gubisch was the first to publish a large series on this technique in 1995.³ The series included more than 1000 patients during a 15-year clinical experience. Gubisch emphasized on the use of morselization technique in extracorporeal septoplasty. In his technique, he had suggested removal of the quadrangular cartilage, flattening it using a septal morselizer and placing it between the mucoperichondrial flaps.³

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With increased understanding of nasal anatomy and its support mechanisms, septal surgery continues to evolve. However, even extracorporeal septoplasty alone can be inadequate to correct a difficult nasal septum as the deformed septal cartilage has to be segmented into several smaller sections. It is not only technically complex but also time consuming as it is difficult to stitch the quadrangular septal cartilage from end to end. Furthermore, such technique can also lead to overlapping of the cartilaginous sections which could cause thickening of the nasal septum. Hence, the use of polydioxanone plates in extracorporeal septoplasty came in to vogue. Polydioxanone has been reported to be advantageous in supporting divided cartilage fragments as it is completely resorbed by the body. Thus long term complications caused by alloplastic graft materials are avoided.

Polydioxanone plates are commonly being used in western countries since 2005 and are yet to be tested in our part of the world. In our study we compare the effectiveness of polydioxanone plate in extracorporeal decortications septoplasty with conventional septoplasty.

In this study we used a modified Sinonasal Outcome Test (SNOT) and Nasal Obstruction and Septoplasty Effectiveness scale (NOSE) as a subjective method of assessment. SNOT comprises of a series of 20 questions best suited for nasal pathology.⁵ Symptoms which were more in favour of sinusitis were omitted and 5 questions best suited for patients with deviated nasal septum were used to formulate the modified Sinonasal Outcome Test.

Diagnostic nasal endoscopy was done at regular intervals to check for complications. We mainly focused on the subjective improvement of the patients' symptoms rather than focusing on the objective analysis and hence we avoided the use of Rhinomanometry since it provided an objective value but had no bearing on the subjective improvement of the patient.¹⁴

The modified Sinonasal Outcome Test (SNOT) showed significant improvement in the post-operative scores for all patients in Group A and Group B. When comparing between the groups, Group A showed better improvement compared to Group B which was found to be statistically significant with a p value of 0.000.

Similar to the SNOT score, the NOSE scoring also showed decrease in the post-operative scores. The difference between the post-operative scores between Group A and Group B showed a greater difference in Group A when compared to Group B with a statistically significant p value of 0.000.

The operative time was markedly more in Group A patients which can be attributed to the complex technique of the procedure which required an initial longer learning curve. Though it is time consuming and technically demanding, it has shown to provide better results. The use of polydioxanone plate can aid this surgical technique. Polydioxanone plate fixes cartilage fragments, supporting the nasal dorsum until the healing process stabilizes the cartilage. It is subsequently resorbed, avoiding long term complications associated with other artificial implants. The degradation products of the synthetic aliphatic polymer does not interfere with the normal healing process and stimulated regeneration of the osteoconductive properties of the bone.

CONCLUSION: Markedly deviated nasal septum cannot be corrected adequately by conventional septoplasty technique. Hence there is a need for more radical approaches to correct such septal deviations. Extracorporeal septoplasty using Polydioxanone (PDS) plate can be recommended as an alternative surgical technique to ensure perfect anatomical correction. Extracorporeal decortication septoplasty using Polydioxanone (PDS) plate provides good functional outcome for patients with

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markedly deviated nasal septum in the medium term (6 months). Longer follow up of 2 years is recommended to arrive at a definitive opinion about extracorporeal decortication septoplasty using PDS plate.

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0	Not a problem
1	Very mild problem
2	Moderate problem
3	Fairly bad problem
4	Severe problem

Table 1: Shows the scoring system for NOSE score as described by Michael G. Stewart et al: *Otolaryngol Head Neck Surg*, 2004.⁴

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0	Not present/no problem
1	Very mild problem
2	Mild or slight problem
3	Moderate problem
4	Severe problem
5	Problem as "bad as it can be"

Table 2: Shows the scoring system for modified SNOT score as described by Piccirillo JF et al: Otolaryngol Head Neck Surg 2002.⁵

Type	Description
Mild	Deviation with adequate airway.
Moderate	Gross deviation with narrow airway but not touching the lateral wall.
Severe	Gross deviation touching the lateral nasal wall.

Table 3: shows the grading of DNS using nasal endoscopy as described by Hong-Ryul Jin et al; J Rhinol 14, 2007.⁶

	Group A	Group B	Total
DNS to Left	14	11	25
DNS to Left with Caudal dislocation	1	0	1
DNS to Right	11	12	23
S shaped DNS	3	7	10
Crooked nose deformity	1	0	1

Table 4: shows the type of deviation in group A and group B.

	Pre-op (Mean) \pm STD	Post-op 6 Months (Mean) \pm STD
Group A	1.927 \pm 0.68	0.307 \pm 0.22
Group B	2.117 \pm 0.45	0.840 \pm 0.43
P Value	0.20	0.00

Table 5: shows the mean modified SNOT score pre-operatively and post-operative (6 months) for both group A and group B.

	Pre-op (Mean) \pm STD	Post-op (Mean) \pm TD
Group A	71.83 \pm 22.42	9.33 \pm 6.40
Group B	75.50 \pm 12.69	20.33 \pm 11.30
P Value	0.44	0.00

Table 6: shows the mean pre-operative and post-operative NOSE score for both group A and group B

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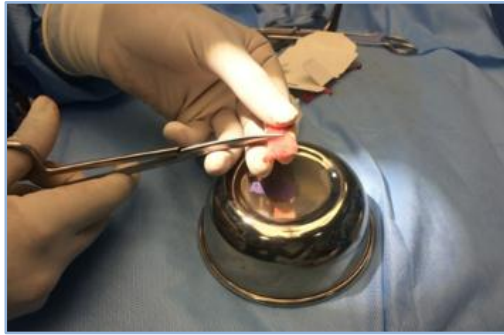


Figure 1: Septal cartilage being cut into Straight Fragments

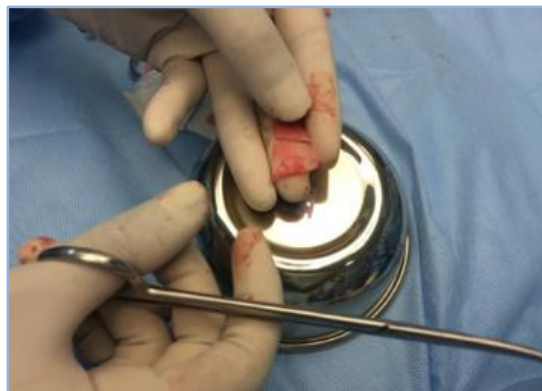


Figure 2: Septal Cartilage Being Shown in Separate Cut Straight Fragments

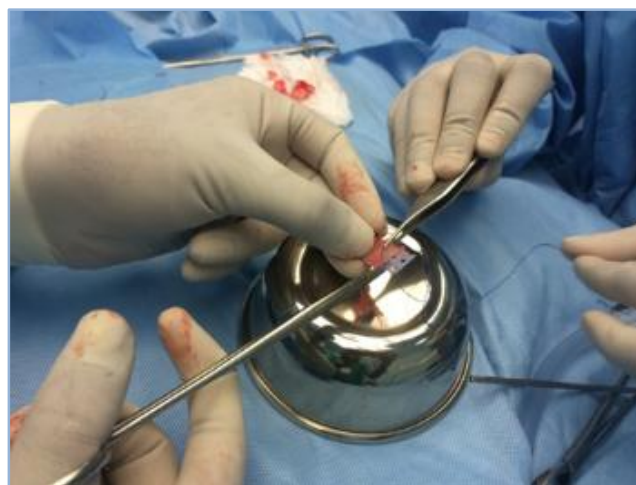


Figure 3: Suturing the cartilage fragments to the PDS plate

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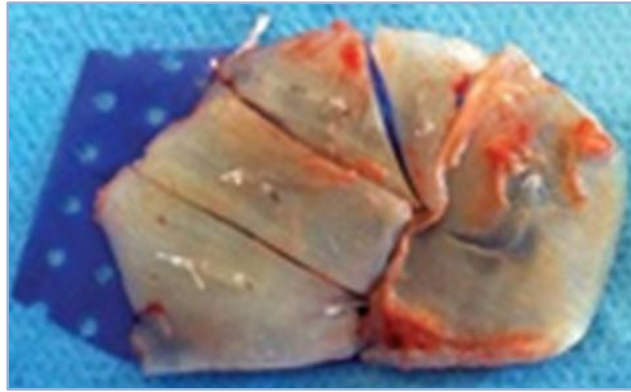


Figure 4: cartilage fragments after Being sutured to the PDS plate



Figure 5: Cartilage Fragments Combined With the PDS Plate Being Positioned Between The Mucoperichondrial Flaps

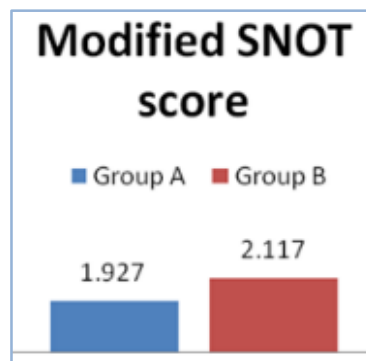
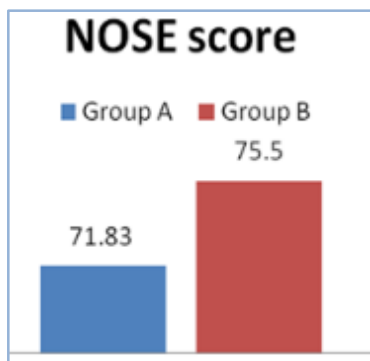


Figure 6.1 & 6.2: Bar charts showing the mean pre-operative NOSE and modified SNOT score for both group A and group B

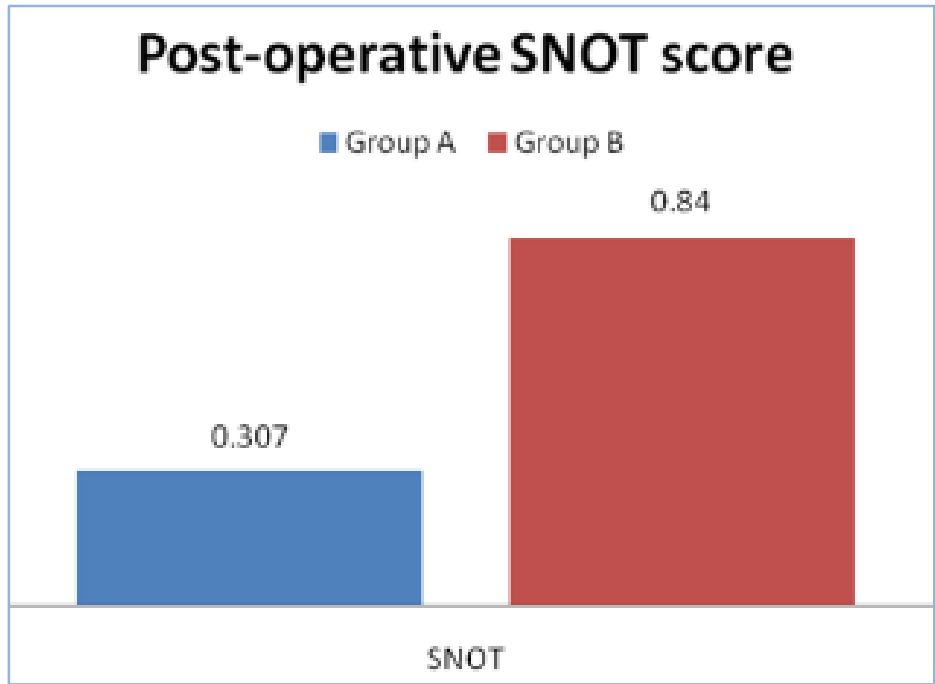


Figure 7: Bar chart showing the post-operative modified SNOT score for both Group A and Group B patients

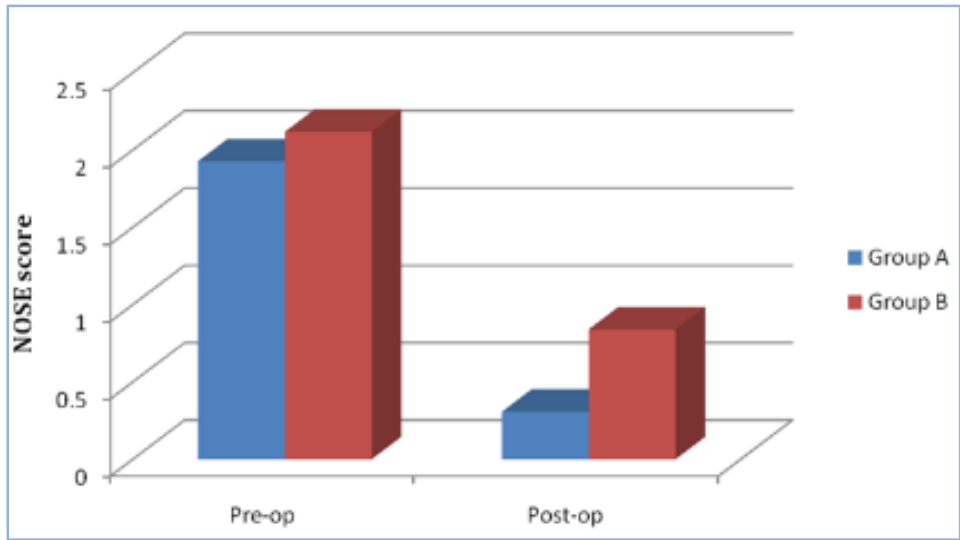


Figure 8: Bar chart showing the mean modified SNOT score pre-operatively and post-operative (6 months) for both group A and group B

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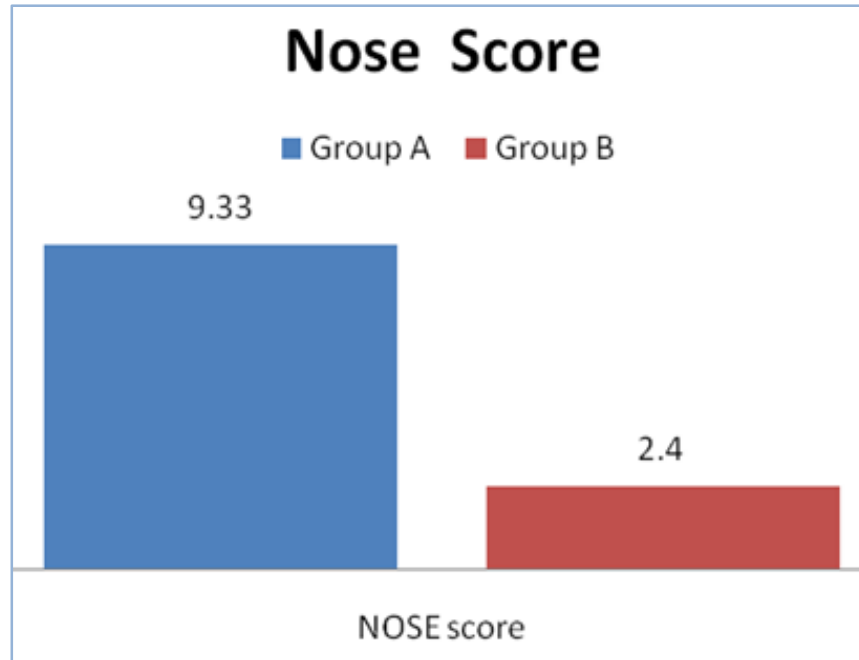


Figure 9: Bar chart showing the post-operative NOSE scores for both group A and group B patients

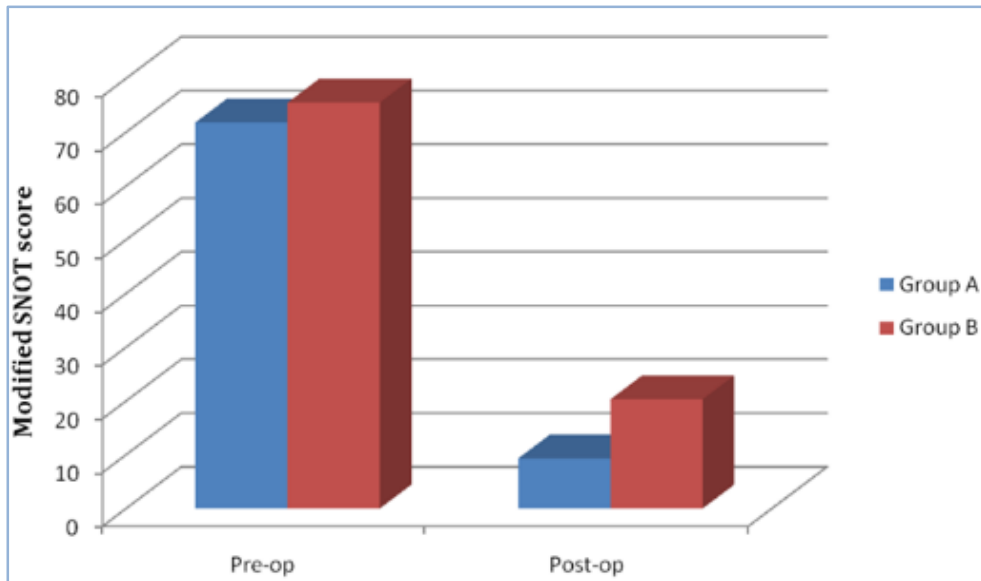


Figure 10: Bar chart showing the mean pre-operative and post-operative NOSE score for both group A and group B

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