Research Article

Minimal invasive nasal valve repair comparison with other surgical methods in treatment of nasal valve obstruction

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Abstract

Background: Nasal obstruction is known to be associated with a major decrease in disease-specific quality of life, for which a considerable role is played by nasal valve obstruction. There are many procedures for treating such type of nasal obstruction. Evaluation of treatment results in relieving obstruction with special regard to the type of the surgery is therefore of increasing importance.

Objective: The evaluation of the effectiveness of minimal invasive valve repair (MIVR) for the treatment of nasal valve obstruction in comparison with the reduction of the size of inferior turbinate by coblation and submucosal diathermy.

Patients and Methods: This is a cross sectional study conducted from the 20th Nov 2011 to the 19th of Sept 2013. The study included 43 patients suffering from nasal obstruction for more than 6 months. The patients were divided into three groups according to the type of surgery carried out (minimal invasive valve repair, coblation and submucosal diathermy of inferior turbinate), the patients were followed up for 3 months, and the data were statistically analyzed.

Results: Patients treated with minimal invasive valve repair showed highly significant differences between the pre-operative and the 1st, 30th and 90th days post-operative total NOSE scale scores (p=.0001). And the differences between the 1st, 30th and 90th days total scores were also significant. While patients treated by coblation and submucosal diathermy showed no significant difference in the mean nose score between pre and immediate postoperative period (p=.705 and p=.2), however there was significant changes in the 30th and 90th days score from the baseline (p=.011 and p=.011) and (p=.001 and p=.001), the postoperative morbidity was less in the minimal invasive valve repair group in comparison with coblation and submucosal diathermy groups.

Conclusion: All the three types of the included surgeries provided good outcome in treating nasal valve obstruction. However, more rapid onset of improvement and lesser postoperative morbidity were reported by minimal invasive valve repair.

Key words: Nasal obstruction. Nasal valve. Nasal valve repair. Submucosal diathermy. Coblation.

INTRODUCTION

The valve area is a more or less triangular or teardrop shaped area which gives access to the internal nasal cavity and considered a "valvular device controlling the inflow of air" and causes the most resistance to breathing"(1). Medially the septum and premaxillary wing demarcate this area, while laterally there is the upper lateral cartilage and the anterior part of the inferior turbinate and caudally is the piriform aperture(1). The internal nasal valve is located between the lower border of the upper lateral cartilage and septum and completed by the head of the lower turbinate(1-3). "According to Mink the included angle amount to 10 to 20 degree in the Caucasian nose; in Afro-Americans and Asians, the angle is clearly increased" (4,5).

Judgment of severity of symptoms due to certain pathologies in the valve area are to be provided by the patient's history. The following are to be looked for during examination of the nasal valve area: any deformities, elasticity of the cartilages, the wideness of the columella, stenosis and the size of piriform opening. Naso-endoscopic assessment, video recording and image analysis are used for documentation of the angle of the nasal valve(6).

"Surgical steps involved in MIVR: incisions are performed approximately 2 mm apart on either side of the caudal upper lateral cartilage (ULC), the mucosa and underlying fibrous tissue are grasped with a fine-toothed forceps and removed with scissors. The caudal ULC is exposed, and approximately 2 mm is excised. Three interrupted 4-0 chromic sutures are used to close the incision"(7).

Aim of Study:-

The evaluation of the effectiveness of minimal invasive valve repair (MIVR) for the treatment of nasal valve obstruction in comparison with the reduction of the size of inferior turbinate by coblation and submucosal diathermy (SMD).

PATIENTS AND METHODS

Study design:-

This is a cross sectional study conducted from the 20th Nov 2011 to the 19th of Sept 2012. The study included 43 patients suffering from nasal obstruction for more than 6 months. The patients were selected for the type of surgery in a chronological manner (every other patient).

Eligibility for the study:-

Inclusion criteria: Persistent nasal obstruction for more than 6 months with positive cottle test or cotton ball test. Failure of medical and or surgical treatment. Age: above 18 years. Sex: both sexes.

Exclusion criteria: Moderate to severe septal divergence. Nasal pathologies like rhinosinusitis, nasal polypii and sinus or nasal tumors.

Following routine clinical assessment and rhinoscopy of the valve area to exclude other pathologies assessment of nasal obstruction was done according to Nasal Obstruction Symptoms Evaluation (NOSE) scale, 1 week before surgery. The patients were informed about the details of the selected procedure to achieve the ethical point of view and written consents were taken from all. They were properly prepared and divided into 3 groups according to the type of surgery:

GROUP A:- Minimal invasive nasal valve repair

Povidone iodine 10% solution was applied as local antiseptic. Surgery was commenced after using local anesthesia with the help of lidocaine hydrochloride 1% and 1:100 000 epinephrine which were injected over the prominence of the caudal ULC. Small gauze packed in the vestibule for 1 hour.

GROUP B:- Coblation of inferior turbinate

The procedure done under general anesthesia and in routine position for nasal surgery. Infiltration of the inferior turbinate by 1% lidocaine with 1:100 000 epinephrine. The surgery was performed using a Coblator II surgery system and a ReFlex Ultra TM 45 wand (ArthroCare) set at power level four.

GROUP C:- Submucosal Diathermy (SMD)

The procedure done under general anesthesia and in routine position for nasal surgery. SMD was performed by spinal needle after preparing the nasal cavity with 1% lidocaine with 1:100000 epinephrine. The needle tip was pressed against the intended point of entry and activated to produce blanching of mucosa. Nasal cavity packed with gauze for 24 hour. Postoperatively patient advice for saline wash.

Follow up: the patients were seen in the 1st, 14th, 30th and 90th postoperative days.

Statistical analysis was performed using the wilcoxon signed rank test for nonparametric analysis of the baseline (pre operative), 24 hour postoperative, 1 and 3 months follow-up scores, for each statistical analysis, a P value < 0.05 was considered statistically significant. All analyses were performed by using SPSS version14.0 software.

RESULT

Duration of nasal obstruction was between 6 months to 30 months with average of 16 months. MIVR was done in 22 patients (51.2 %), coblation done in 8 patients (18.6 %) and SMD done in 13 patients (30.2 %).

- Changes in the means of NOSE total score:

Table 1 show the means of total NOSE scores changes in group A in different times of the study.

treatment modality group			pre-op total score	post-op total score	1 month POD total score	3 month POD total score
MIVR	N	Valid	22	22	22	22
		Missing	0	0	0	0
	Mean		42.73	25.45	16.59	15.91
	Minimum		25	20	5	5
	Maximum		60	35	50	50

***POD= postoperative day**

Table 2 show the means of total NOSE scores changes in group B in different times of the study.

treatment modality group			pre-op total score	post-op total score	1 month POD total score	3 month POD total score
coblation	N	Valid	8	8	8	8
		Missing	0	0	0	0
	Mean		47.50	49.38	25.63	11.25
	Minimum		35	40	20	5
	Maximum		65	60	40	20

Table 3 show the means of total NOSE scores changes in group C in different times of the study.

treatment modality group			pre-op total score	post-op total score	1 month POD total score	3 month POD total score
SMD	N	Valid	13	13	13	13
		Missing	0	0	0	0
	Mean		52.31	55.77	19.62	9.23
	Minimum		35	40	0	0
	Maximum		70	70	25	15

The Wilcoxon signed rank test are used to compare the change in the mean of the total NOSE scale scores between the baseline scores and 24hour, 1&3 months scores for each group (table 4) and then between the postoperative periods (table 5).

Table 4 show the P-value for NOSE score before and after surgery

Treatment modality group		Post-op total Score - pre-op Total score	1 month POD Total score - Pre-op total Score	3 month POD Total score - Pre-op total Score
MIVR	Z	-4.051 a	-4.023 a	-4.022 a
	Asymp. Sig. (2-tailed)	.000	.000	.000
Coblation	Z	-.378 b	-2.546 a	-2.546 a
	Asymp. Sig. (2-tailed)	.705	.011	.011
SMD	Z	-1.282 b	-3.192 a	-3.188 a
	Asymp. Sig. (2-tailed)	.200	.001	.001

a. Based on positive ranks.
b. Based on negative ranks.
c. Wilcoxon Signed Ranks Test

Table 5 show the P-value for NOSE score for different postoperative periods

treatment modality group		1 month POD total score - post-op total score	3 month POD total score - post-op total score
MIVR	Z	-2.555[a]	-2.599[a]
	Asymp. Sig. (2-tailed)	.011	.009
coblation	Z	-2.539[a]	-2.555[a]
	Asymp. Sig. (2-tailed)	.011	.011
SMD	Z	-3.195[a]	-3.194[a]
	Asymp. Sig. (2-tailed)	.001	.001

a. Based on positive ranks.
b. Wilcoxon Signed Ranks Test

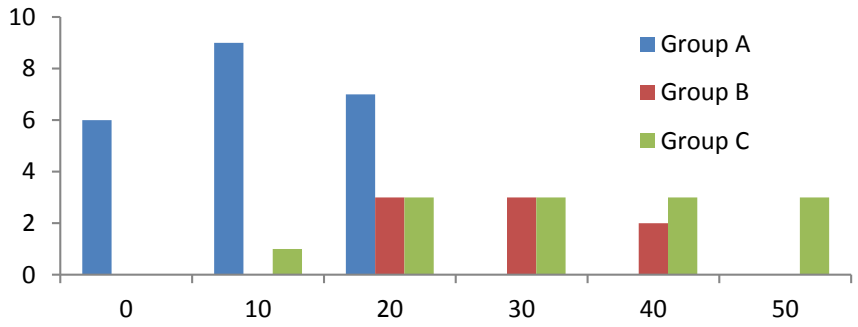
- Postoperative morbidities

1) Bleeding after intranasal pack removal was reactionary in group A patients (less than 24 hours), while in the group B and C it was secondary (more than 24 hours), non of patients had severe bleeding and need re-packing.
2) Postoperative Pain assessed by visual analogue scale (VAS) for the 3 groups before removing the intranasal pack.
3) Time of intranasal pack removal. All patients in group A had their pack removal after 1 hour from surgery with mild reactionary bleeding which was self-limited, while patients in group B and C had their pack removed after 24 hour with 2 patients in group B and 7 patients in group C had moderate secondary bleeding, the rest of patients in both groups had only mild secondary bleeding.
4) Postoperative crusting. Evaluation of crust formation done on the 14th postoperative day visit by using a 4-point scale (0, absent; 1, mild; 2,moderate; 3, severe).

Table 6 show the frequency of post-operative bleeding

Group	Mild*	Moderate**	Severe***
A	22(100%)	0	0
B	6(75%)	2(25%)	0
C	6(46%)	7(54%)	0

***= bleeding is self-limited**
****= bleeding control by simple pressure with pack**
*****=bleeding need re-packing**



Scheme 1:- frequency of VAS scores of postoperative pain in the 3 groups

Table 7: The frequency of patients according to crust formation in 14th postoperative day

Groups	None(0)	Mild(1)*	Moderate(2)**	Sever(3)***	mean± SD
A	14(63.6%)	8(36.4%)	0	0	0.36±0 .492
B	2(25%)	5(62.5%)	1(12.5%)	0	0.88± 0.641
C	2(15.4%)	6(46.2%)	5(38.5%)	0	1.23± 0.725

***mild- crust on medial or lateral wall only//**moderate- crust between medial and lateral wall**
*****sever-crust obstructed nasal cavity**

DISCUSSION

"The fundamental tenets of this surgical technique were first described in an obscure 1970 publication by Gray and later cited in 1978 by Kern in his review of nasal valve surgery" (7).

The current study revealed that the duration of nasal obstruction was between 6-30 months with 16 months as an average, while no other studies revealed the duration of obstruction before surgery (8-10).

Changes in the means of NOSE total score:

Group A showed highly significant difference in the mean of nose total score between pre- and 1st, 30th and

90th days post-operatively (p=.0001). And the differences between 1st and 30th and 90th days total scores were also significant (p=0.011 and p=.009), these results run parallel to the results of Robert W. Dolan study (2010) (7) although he compared preoperative with the 3rd months post-operative scores only. The minimum inflammatory response which is due to the least surgical intervention explain the early considerable improvement, while the delayed improvement in the scores was due to widening of the valve area caused by scar tissue formation. These important results are also supported by the fact that the aim of this type of surgery (MIVR) is designed to hit the uppermost aspect of the nasal valve. "This result seems to provide the most dramatic relief of obstruction with this minimalist surgical method" (7).

In group B there was no significant differences in the mean NOSE score between pre and immediate postoperative period (p=.705), these results were similar to the results of Cingi study (2010)(9), and this may be "explained by the early tissue response to the trauma of surgery, which comprises an inflammatory phase, a lag phase and a proliferative phase, in the nasal mucosa, this characteristically results in oedema, rhinorrhoea and crusting during healing"(11), as in other studies by Farmer, Quine and Eccles (2009)(8) and Neil and Lynn study (2003)(12) they review there result in 2nd week,3rd and 6th months.

There was significant change in the 1st and 3rd months score from the baseline (p=.011 and p=.011), there was also significant difference between immediate post-operative and 1st and 3rd month score (p=.011 and p=.011) these results are compatible with the results of other studies (8,9,11,12), this is explained by the slow development of fibrosis which leads to the shrinkage of the tissue of the inferior turbinate post-operatively.

In group C the difference between mean total score of pre-operative evaluation and 24th hour post pack removal was not significant (p=.2),but it became highly significant in comparison with the 1st and 3rd months score (p=.001 and p=.001), the difference between immediate postoperative and 1st and 3rd months was also highly significant (p=.001), it is well known that thermal injury lead to excessive inflammation and swelling of the injured tissues manifested as a period of worsening of the nasal obstruction before improvement take place (13,14). Study by Warwick-Brown and Marks (1987) of over 300 patients treated with "sub-mucosal diathermy or linear cautery demonstrated subjective improvement in 82% of patients after one month"(15). Subsequent studies reported that subjective improvements in nasal airflow occur in between 76 per cent and 95 per cent of patients one to three months after surgery(16-20). "It would appear that the subjective sensation of nasal obstruction does worsen in the immediate post-operative period between one and 10 days".(16,21,22). Simpson and Groves (1958)(21) suggested that "turbinate shrinkage begins three to five days after sub-mucosal diathermy and continues between three and four weeks".

Postoperative morbidity:

Reactionary bleeding after intranasal pack removal was mild and it was self limited in all patients (100%) of Group A, Dolan (2010)(7) had no comment on any significant bleeding postoperatively. Two patients (25%) in group B had moderate secondary bleeding while other 6 patients (75%) had only mild bleeding, this is similar to Cingi (2010)(9), who reported 2 cases of bleeding in 144 patients treated with coblation, Neil and Lynn (2003) reported only 8.3% incidence of severe bleeding postoperatively(12). While Matteo (2005) revealed that there was no uncontrolled bleeding observed after surgery(23). In group C, 6 patients (46%) had mild bleeding and 7 patients (54%) had moderate bleeding which was controlled by simple pressure pack, none of the patients had severe bleeding and needed re-packing, Antonio (2006) "reported 60% mild bleeding and 40% moderate bleeding in 10 patients treated with SMD"(24), the difference between the results of the current study and Antonio study may be due to small sample size.

The postoperative pain in the three groups was mild-moderate according to VAS, this was consistent with the results found by Antonio (2006)(24), Kizilkaya (2008)(11) and Neil and Lynn (2003)(12) which show mild pain severity. The degree of the mean pain severity in the three groups was in group A (10.5), in group B (28.8) and in group C (33.1) this may be related to longer period of nasal packing, these results were similar to the results reported by Thomas (1996)(25).

All patients in group A had their pack removed after 1 hour while in group B and C had the pack removed after 24hours, these results were similar to that of Thomas(1996)(25) in decreasing the post operative pain without increasing the chance of bleeding.

Only eight patients (36.4%) in group A had mild crust formation in the 14th postoperative day, whereas Dolan study (2010)(7) had not reported any postoperative crusting as he evaluated his results 3 months postoperatively were most of crusts were disappeared by that time. Two patients in group B (25%) had no crustation and one (12.5%) had moderate crust while the remaining five patients (62.5%) had only mild crusting, nearly similar to study of Neil and Lynn (2003)(12) as they noted (16.7%) crust formation in 2

weeks follow up. While Matteo (2005)(23) reported no crust formation. Five patients (38.5%) in the group C had moderate crusting while the rest 8 patients (71.5%) had either none or mild crusting, these results are parallel to the results of Antonio (2006)(24) who reported 60% of none crust formation and 40% moderate crusting although there is some difference in grading scale with our study as he did not take mild crust formation within his grade.

Conclusion:

All the three types of the included surgeries provided good outcome in treating nasal valve obstruction. However, more rapid onset of improvement and lesser postoperative morbidity were reported by MIVR.

Recommendations:

The current study advise that MIVR is recommended for correction of nasal valve obstruction over other procedures. Greater number of patients are to be included in further studies.

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