Egyptian Journal of Medical Research (EJMR)

Microdebrider-Assisted Turbinoplasty in Children with Hypertrophic Inferior Turbinate

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Abstract:

This study was conducted to is to assess the role of microdebrider assisted turbinoplasty in children with hypertrophic inferior turbinate in the long-lasting reduction of the turbinate size, preservation of the turbinate mucosal surface, maintenance of the function and complications, the study was designed as a prospective cohort series study. The study was held in Beni-Suef specialized hospital and in Beni-Suef university. This study included 40 patients in childhood period of (9 to 15) years old with hypertrophic inferior turbinate were diagnosed and all patients were be treated by Microdibreder assisted turbinoplasty. This study revealed that the maximum time for debriding the turbinate was 30 minutes and the minimum time was 20 with an average 22.5 minutes. During the operation 5 patients had mucosal tears (25%) and only in 2 patients (5%) suction electrocautery was used to achieve hemostasis. In 4 patients, bony turbinate was thick (10%) and n 36 patients it was thin (90%). There was a significant improvement of the nasal obstruction and other symptoms of hypertrophy. This study concluded that Microdebrider is the best technique used to improve nasal obstruction caused by hypertrophic inferior turbinate in children by decreasing its size with the ability to preserve the entire turbinal mucosa, except for a notch in the anterior pole of the turbinate. Keeping its functional structures intact, the turbinate can remain fully normal after the procedure.

Keywords: Hypertrophic, Microdibreder, turbinoplasty

1. Introduction:

Nasal obstruction can be caused by a variety of reasons, including adenoid hypertrophy, hypertrophic inferior turbinates, septal deviation, and nasal polyps, which are all linked to allergic and non-allergic rhinitis (1).

Nasal blockage is the most prevalent ailment that has a substantial impact on one's quality of life. This leads to increased airway resistance and sleep breathing problems. Patency is critical for craniofacial development in children; mouth breathing causes high arched palates, long faces, and retrognathia in adults, continuing blockage (2).

The turbinates are key structures that arise from the nose's lateral wall. Normally, there are three turbinates: the superior and middle turbinates are part of the ethmoid bone, but the inferior turbinate is a distinct bone. The ethmoid, palatine, and lacrimal bones all articulate with the inferior turbinate bone. The middle turbinate is smaller and extends downwards over the maxillary and ethmoid sinus openings. The inferior turbinate and the middle turbinate carry the majority of the inhaled airflow (3).

The inferior turbinate is the largest and most vascular, with an abony portion covered in highly vascularized erectile soft tissue and pseudostratified columnar epithelium. Each one plays a unique role in turbinate hypertrophy. The isthmus nasi is the narrowest section of the nose (4).

Because 50% of airflow is directed through the middle section of the airway, the relative magnitude of inferior turbinate hypertrophy is critical. Inhaled air is also humidified, heated, and filtered by it (5).

In addition to nasal allergies, environmental irritants, or chronic sinus inflammation, malformation of the nasal septum can induce larger turbinates, and less commonly, the presence of a concha bullosa can generate enlarged inferior turbinates (6).

Medical treatments such as steroid nasal spray, antihistaminics, and decongestants are used as the first line of treatment for hypertrophic inferior turbinates. However, medical treatment may be ineffective for a variety of reasons, including: 1-long-term usage of systemic medicine with a sluggish response 2-Inadequate medical treatment time. 3-Hypertension and diabetes are examples of systemic disorders (7).

Despite the fact that pharmacological therapies are frequently beneficial in relieving nasal obstruction, if symptoms improve marginally, some patients will increase their use of local decongestants, nasal spray, and systemic anti-allergic medicines, all of which carry a significant risk of iatrogenic side effects. For reliving hypertrophy in these cases, surgical reduction of the inferior turbinate is the better option (8).

We usually avoid turbinectomy in children under the age of 15 due to a single narrow child nostril that is worsened by significant nasal synechia and crustation. 2-The developing bony component of the turbinates increases the rate of recurrence after surgery. 3-excessive turbinate excision in a broad nose syndrome (Roomy nose) (9).

Cryotherapy, submucosal cautery, surface cautery, partial turbinectomy, and laser turbinoplasty are some of the procedures utilised in children to reduce the volume of the mucosal tissues and the bony component of the hypertrophic inferior turbinate. However, the majority of these procedures result in postoperative problems such as nasal haemorrhage, crusting, bad odour, discomfort, hyposmia, and synechia (10).

The respiratory epithelium on the turbinate surface is damaged by all of the techniques outlined above to variable degrees. As a result, the major goal of our surgical microdebrider treatment should be to reduce complaints while protecting mucosal surfaces with some submucosal tissue reduction and achieving ideal volume reduction (11).

In children, the most appropriate strategy is to preserve the mucosal surface with little submucosal reduction and to avoid postoperative problems such as synechia, crustation, postoperative haemorrhage, and overexcision of the turbinate, which can lead to atrophic rhinitis (Wide nose syndrome) (12).

Various surgical methods have been described, each with benefits and drawbacks. If the turbinate mucosa is destroyed (surface electro cautery, cryosurgery, or total turbinectomy), the turbinate function is likely lost. Injection of steroids or sclerosing agents can retain turbinate function but has only a modest or short-term effect on submucosal tissue volume reduction (13).

Postoperative results were better with turbinoplasty, which involves removal of submucosal soft tissues or bone of the turbinate. A rigid nasal endoscope is preferred by most authors (14).

Most studies resect the lateral inferior mucosa and submucosa in children but not in adults. In order to minimise synicha after resection, several authors avoid damaging mucosal tissue. For patients with inferior hypertrophic turbinates, turbinoplasty is the most effective and low-morbidity treatment option available (15).

Endoscopic microdebrider-assisted turbinoplasty is a new procedure. Compared to previous surgical procedures, endoscopic microdebrider-assisted turbinoplasty is less intrusive, allows preservation of physiological nasal mucosa, and is a painless and bearable operation performed under general anaesthesia (16).

This study was conducted to is to assess the role of microdebrider assisted turbinoplasty in children with hypertrophic inferior turbinate in the long-lasting reduction of the turbinate size, preservation of the turbinate mucosal surface, maintenance of the function and complications.

2. Patients and methods:

This A cohort Case series study including 40 childhood period of (9_15) years old, attending Beni Suef university hospital for decreasing a volume of hypertrophic inferior turbinate using Microdebrider assisted turbinoplasty.

- **Inclusion criteria:**

1. Patient of 9 to 15 year.
2. Patient with bilateral chronic hypertrophic inferior turbinate.
3. Patient has no adenoid, septal deviation, nasal polyp and sinusitis.
4. Patients do not respond to medical treatment.

- **Exclusion criteria:**

1. Patients not in between 9_15 years.
2. Patients who had prior history of sinus and nasal surgery as FESS.
3. Patients with adenoid, nasal septal deviation or sinusitis.
4. Patients failed with medical trial treatment.

Methods:

1- Full history taking including ages, sex, duration of nasal obstruction and effect of medical treatment.

2- Classic and endoscopic examination of nasal turbinate hypertrophy.

3- Preoperative preparation of patients to be fit for surgery through full labs, pediatric consultation and general anesthesia consultation were done.

4- An informed consent was obtained from all parent patients including in study.

5- All patients are treated by microdebrider.

6- Operative procedure***:***

The inferior turbinate was decreased using a 0° rigid nasal endoscope. 2–3 ml 2% xylocaine with adrenaline or 1:200,000 saline with adrenaline were injected into the inferior turbinates. This submucous injection helps separate the turbinate mucosa from the stroma. A tiny incision is created in the mucosa of the inferior turbinate medially using a No. 15 scalpel blade. The turbinate mucosa was separated from the stroma using an endoscopic septal sucker dissector. The inferior turbinate's mucosal lining was avoided. It was used through the incision with a 4 mm tip and tricot blade. The blade was positioned laterally from the submucosal plane. And start eating submucosal tissues until turbinate volume and nasal space are appropriate. The debrider cutting edge should always be directed towards the stroma and never the mucosa. Reverse the procedure, taking the same precautions. Insert bilateral anterior nasal merocele packs.

Postoperative care: two-day hospitalisation followed by six-month follow-up at an outpatient clinic.

Data management:

The information was gathered on specially constructed forms, then updated, checked, and altered using computer tools. After that, the data was statistically evaluated on an IBM computer using SPSS (statistical programme for social science version 25), with a P value of 0.05 considered significant.

3. Results:

The patient's mean age was 9-15 years. Their mean age was 14±1.20 years Female patients were 24 (60%) and male patients were 16 (40%), this shown in Table (1).

All the patients were complaining of bilateral persistent chronic nasal obstruction that increases gradually with a progressive course. In 32 patients the obstruction was severe (80%) and in the remaining 8 it was moderate (20%). This is shown in table (2). In addition to their main complaint of nasal obstruction most of patients had associated symptoms as snoring (20 patients, 50%), headache (14 patients, 35%). This is shown in table (3). Endoscopic examination under local lidocaine revealed that the main cause of nasal obstruction was bilateral hypertrophy of the inferior turbinate. According to the degree of turbinate hypertrophy, 32 patients had grade III turbinate hypertrophy (80%) and 8 patients had grade II turbinate hypertrophy (20%). This is shown in table (4)

Table (1) Age and sex distribution among the studied patients:

Characteristics	Values
Age	
Mean±SD	14±3
Range (min-max)	(9-15)
Age categories: no (%)	
9 to <11	10(25%)
11 to <13	16 (40%)
13 to 15	14 (35%)
Sex: no (%)	
Males	16 (40%)
Females	24 (60%)

Table (2): The degree of pre-operative nasal obstruction:

Degree of nasal obstruction	Number of patients	
Moderate	8	20%
Severe	32	80%

Table (3): Associated pre-operative symptoms:

Symptoms	Number of patients	
Snoring	20	50%
Headache	14	35%

Table (4) Pre-operative endoscopic assessment of the degree of turbinate hypertrophy:

Grade of hypertrophy	Number of patients (40)	
Grade II	8	20%
Grade III	32	80%

(4) Operative data:

The maximum time for debriding the turbinate was 30 minutes and the minimum time was 20 with an average 22.5 minutes. During the operation 5 patients had mucosal tears (25%), 2 of them were considered having small tears and 3 patients had large one. Bleeding from these tears was controlled by insertion of a small vasoconstrictive adrenaline pack for a few minutes during operation. Only in 2 patients (5%) suction electrocautery was used to achieve hemostasis. In 4 patients, bony turbinate was thick (10%) and n 36 patients it was thin (90%).

Postoperative were followed up post first week, first month and post six month as showing in following tables (5,6,7,8).

Table (5): Subjective assessment of nasal obstruction during the postoperative follow up period:

Nasal obstruction	**1 week post Operative**		**1 month post Operative**		**6 months post Operative**	
Absent	10	25%	30	75%	36	90%
Mild	20	50%	6	15%	4	10%
Moderate	10	25%	4	10%	0	0%
P-value (1 week vs 1 month post-operative)	<0.001**(McNemar=26)					
P-value (1 week vs 6 month post-operative)	<0.001**(McNemar=29)					
P-value (1 month vs 6 months post-operative)	0.011*(McNemar=9)					

Table (6): Prognosis of associated symptoms during the postoperative follow up period:

Symptoms	1 week post Operative No=40(%)		1 month post Operative No=40(%)		6 months post Operative No=40(%)	
No symptoms	16	40%	30	75%	37	92.5%
Snoring	6	15%	2	5%	0	0%
Headache	10	25%	4	10%	1	2.5%
P-value (1 week vs 1 month post-operative)	**<0.001**(McNemar=20)**					
P-value (1 week vs 6 month post-operative)	**0.001**(McNemar=22)**					
P-value (1 month vs 6 months post-operative)	0.092(McNemar=8)					

Table (7): Objective assessment of turbinate hypertrophy post operatively.

Degree of turbinate hypertrophy	1 week post operative		1 month post Operative		6 months post Operative	
Grade I(mild)	30	75%	34	85%	36	90%
GradeII (moderate)	10	25%	6	15%	2	5%
P-value (1 week vs 1 month post-operative)	**<0.001**(McNemar =21.2)**					
P-value (1 week vs 6 month post-operative)	**0.012*(McNemar =6.2)**					
P-value (1 month vs 6 months post-operative)	**0.138(McNemar=2)**					

Table (8): postoperative complications:

Complication	1 week post Operative		1 month post operative		6 months post Operative	
Pain & discomfort.	10	25%	-	-	-	-
Smell of bad odor	4	10%	-	-	-	-
Epistaxis	4	10%	-	-	-	-
Mucosal tears	5	25%	-	-	-	-
Crusts	4	10%	2	5%	-	-
Adhesions	4	10%	2	5%	-	-

4. Discussion:

Cryotherapy, submucosal cautery, surface cautery, partial turbinectomy, and laser turbinoplasty have all been used to treat hypertrophied turbinates in children (17).

By producing scarring or direct destruction, electrocautery and cryosurgery can diminish the volume of the turbinates. Although these treatments are straightforward and can be done under local anaesthetic, the outcomes have been inconsistent and temporary (18).

Power devices such as "microdebriders" and "shavers" have recently become popular in turbinate surgery. These tools are frequently used in conjunction with an endoscope on the turbinate surface as well as intraturbinally. Many surgeons employ the microdebrider intraturbinally, whereas others resect sections from the lateral and inferior borders of the turbinate. The latter procedure is said to be quick, effective, and well tolerated, with a low rate of morbidity (19). Abdelhak conducted a study on 40 children aged 6 to 16 years old who underwent microdebrider assisted turbinoplasty with a three-month follow-up. Around 90% of patients went from severe or moderate nasal obstruction “pre-operatively” to mild or complete nasal obstruction; 80% of patients had grade I nasal obstruction improvement and only 14 patients had grade II nasal obstruction improvement; and only 10% of patients suffered crustation. This study's finding is similar to ours in terms of nasal blockage relief (20).

Langille and Hakim conducted another trial in which 46 children were separated into two groups: one was treated with a microdebrider, while the other was treated with radiofrequency turbinoplasty. Patients treated with a microdebrider fared better than those treated with radiofrequency. Individuals were observed for two years; in the second year, patients who had radiofrequency turbinoplasty had considerably lower efficacy than those who had a microdebrider. This finding is consistent with our research on mucosal surface preservation (16).

With endoscope, wound healing conditions are excellent throughout follow-up. In the second week after surgery, there is essentially no crusting. Symptoms such as nasal congestion and headaches were common in our instances. Improvements following a power endoscopic turbinoplasty procedure. Because the mucosa and its neurovascular supply were intact, no atrophic alterations were identified (6).

The occurrence of postoperative bleeding was about 10% (4/40) in the first week and was resolved with temporary packing of a vasoconstrictive agent.

Post first month the absence of permanent synechiae, crusting, and foul odor in our study suggests that there was no interference with the normal functioning and physiology of the nasal mucosa. No atrophic changes were observed, Furthermore, conchal osteonecrosis did not occur due to minimal exposure of the conchal bone.

That there was a statistically significant improvement of the associated symptoms as snoring, pain and headache between 1 week and 1 month postoperatively and between 1 week and 6 months (P-value <0.001 and 0.001), but there was no statistically significant change of the associated symptoms between 1 month and 6 months (P-value=0.092) however the associated symptoms disappeared in 7 extra cases between 1 month and 6 months.

That there was a statistically significant improvement of the nasal obstruction between 1 week and 1 month postoperatively, between 1 week and 6 months, and between 1 month and 6 months (P-value <0.001, <0.001 and 0.011). The rate of improvement of nasal obstruction was higher between 1 week and 1 month than between 1 month and 6 months.

Endoscopic examination show that there was a statistically significant improvement of the turbinate hypertrophy between 1 week and 1 month postoperatively and between 1 week and 6 months (P-value <0.001 and 0.012), but there was no statistically significant change of the turbinate hypertrophy between 1 month and 6 months (P-value=0.138).

5. Conclusion:

Microdebrider is the best technique used to improve nasal obstruction caused by hypertrophic inferior turbinate in children by decreasing its size with the ability to preserve the entire turbinal mucosa, except for a notch in the anterior pole of the turbinate. Keeping its functional structures intact, the turbinate can remain fully normal after the procedure.

6. References:

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