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Medial Osteoectomy as a Routine Procedure in Rhinoplasty: Six-Year Experience with an Innovative Technique

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Abstract

Background Medial osteotomy is an integral part of most rhinoplasty procedures, and when improperly performed, it is associated with postoperative complications and nasal contour deformities. In this article, we present a minimally traumatic and easy-to-perform medial osteoectomy technique with a pair of pliers, as a routine procedure, instead of the traditional medial osteotomy with osteotome and hammer. We report our experience with the use of the technique in a series of rhinoplasty procedures and review in brief the existing literature.

Methods One hundred and thirty-five patients underwent rhinoplasty operations to correct aesthetic nose deformities, with the use of the suggested surgical technique. Two different types of medial osteoectomy, performed with the pliers, were used: Type I for dorsal nasal hump reduction and slight narrowing of the nose and type II for the management of a wide nasal dorsum along with or without hump removal.

Results Postoperative results were favorable, by both clinical examination and comparison of preoperative and postoperative photographs, in 98.5% of patients. Only two patients with wide nasal dorsums had inadequate narrowing of their broad nose and underwent successful revision surgery.

Conclusions The suggested technique is easy to perform, has a short learning curve, provides high accuracy over the location and amount of the nasal bone to be removed, but inflicts minimal trauma. As a result of the aforementioned advantages, the risk of postoperative complications is low, and most importantly, reliable, consistent, and aesthetically pleasing results are easily ensured.

Level of Evidence IV This journal requires that authors assign a level of evidence to each article. For a full description of these Evidence-Based Medicine ratings, please refer to the Table of Contents or the online Instructions to Authors www.springer.com/00266.

Keywords Medial osteoectomy · Medial osteotomy · Rhinoplasty

Introduction

Osteotomies are integral parts of almost every rhinoplasty procedure, and they are performed to correct bony deformities [1, 2]. Medial osteotomy or a variation is traditionally performed at the apex of the open roof, following hump reduction [2, 3]. The main aim of medial osteotomy, in combination with lateral osteotomy, is to facilitate the reduction and manipulation of the osteotomized lateral segment of the nasal vault. Moreover, its contribution is crucial in the effective narrowing of the wide nasal base, even in the absence of a hump. Finally, it can prove helpful in the correction of the deviated nose [4].

The fundamental technique of medial osteotomy and its variations involves the use of either a straight or a curved osteotome, which usually creates a controlled cut between the nasal bone and the septum up to the thicker frontal bone [1, 2, 5]. Despite the variety of the already existing medial

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osteotomy techniques, there is still skepticism on their efficacy to ensure consistent predictable aesthetic and functional results [2, 6].

The aims of this study were twofold: first to report our experience with the use of medial osteoectomy, as a routine procedure in rhinoplasty, instead of medial osteotomy, and second to introduce an innovative method of performing medial osteoectomy with a pair of pliers instead of a traditional osteotome. We report our experience with the use of this technique in a series of rhinoplasty procedures and review in brief the existing literature.

Patients and Methods

Over the past 6 years, a total of 135 patients (50 males and 85 females, ranging in age from 18 to 46 years, mean 27 years) underwent rhinoplasty operations to correct aesthetic nose deformities, with the use of the suggested surgical technique. One hundred and fourteen (114) patients required dorsal nasal hump reduction in conjunction with slight narrowing of the nose. Twenty-one (21) patients were operated on for management of a wide nasal dorsum along with (15 patients) or without (6 patients) hump removal. Ten cases were secondary rhinoplasties. All operations were performed by the senior author (E.G.L) with the open rhinoplasty approach. The aesthetic and the functional results were evaluated, at least at 12 months postoperatively, by means of both clinical examination and comparison of preoperative and postoperative photographs (front, profile, and basilar views). The clinical parameters evaluated were the symmetry of the bony nasal vault, closure of the open roof, management of the wide nasal dorsum, consolidation of bone fractures, presence of postoperative nasal contour deformities, and potential functional impairment.

Surgical Technique

The applied surgical technique involves removal of a bone segment from the bony nasal vault with a pair of pliers. The pliers used (extraction pliers for wires LX185R-Aesculap, Germany) have a double action fulcrum (pivot), and their jaws are finely serrated, triangular in shape, and taper to 1 mm (Fig. 1).

Separation of skin and subcutaneous tissue from the underlying nasal cartilage and bone and completion of hump reduction with the use of a straight double-guarded osteotome, in case of existence of a hump, are followed by bone removal from the nasal vault with the aid of the pliers. Detachment of the nasal mucous membrane and periosteum from the nasal bone is performed with the use of a freer dissector just before bone removal. Then, the jaws of

Fig. 1 Pliers used for implementation of medial osteoectomies (extraction pliers for wires LX185R-Aesculap, Germany)

the pliers are applied to the selected bone area, and maximum hand grip force is exerted repetitively to the handles of the pliers (Fig. 2). This force is amplified by the double action fulcrum of the pliers, and transmitted, as an enormous crushing power to the bone gripped by the jaws of the pliers. The crushed bone segment is then easily detached and removed with gentle twisting movements of the wrist to avoid unfavorable fragmentation. The procedure is repeated as many times as necessary, depending on the shape and the amount of bone to be removed (Fig. 3).

The exact area, as well as the amount of bone that has to be removed, depends on the bony characteristics of the patient's nose, as well as in judgement of the surgeon. However, as a guide, we suggest two different patterns (types I and II) of bone removal, which can be followed depending on whether the aim is simply to facilitate medial mobilization of the nasal sidewall, or to correct (narrow) a wide nasal dorsum. Type I osteoectomy is performed to facilitate medial mobilization of the nasal sidewall following hump removal. An isosceles trapezium-shaped segment of the nasal bone, the same as the shape of the jaws of the pliers, is removed. It involves the area between the lines of a paramedial oblique and a lateralized paramedial osteotomy (Fig. 4). Type II osteoectomy is performed for the management of a wide nasal dorsum. A rectangle trapezium-shaped segment of the nasal bone is

Fig. 2 Pliers engaged in the selected bone area to be removed

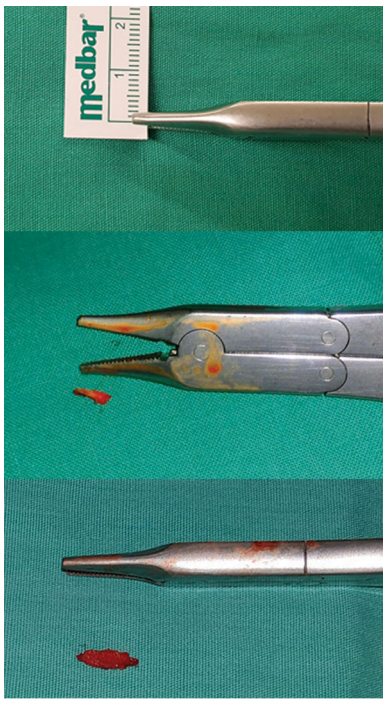

Fig. 3 The jaws of the pliers with a ruler between them to show their actual size (*upper*). Bone segments of different sizes and shapes (depending on the needs of each patient) removed with the use of the pliers (*middle*, *lower*)

removed. This bone segment represents the area between the lines of a medial and a lateralized paramedial osteotomy (Fig. 5). Removal of the aforementioned nasal bone segment is easily ensured, making as many passes as necessary, usually two or three, with the appropriate angle of approach of the jaws of the pliers. Both types of osteoectomy are followed by low-to-high lateral osteotomies with guarded curved osteotomes. Finally, medialization of the nasal sidewall is easily achieved, with slight digital pressure to the small not fractured superomedial segment of the lateral bony vault.

Results

All patients of group I (114) underwent dorsal nasal hump reduction followed by type I osteoectomy. Patients of group II (21) underwent either hump reduction followed by type II osteotomy (15), or exclusively type II osteoectomy (6). The postoperative results were judged to be favorable, by both clinical examination and comparison of preoperative and postoperative photographs in 98.5% of patients. In only two patients of group II, inadequate narrowing of their broad nose was achieved. Both patients underwent successful revision surgery. No nasal asymmetry, nasal contour deformity, functional impairment, or visible cutaneous

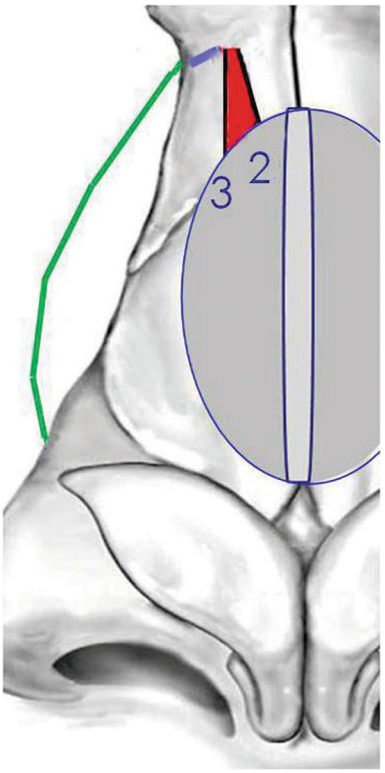

Fig. 4 Line drawing of type I osteoectomy: The *red area* between the *black lines* is the bone segment that has to be removed. *Line 2* represents the direction of a paramedial oblique osteotomy and *line 3* the direction of a lateralized paramedial osteotomy. The *green line* represents the lateral osteotomy, whereas the *short blue line* is the area of the manually inflicted fracture

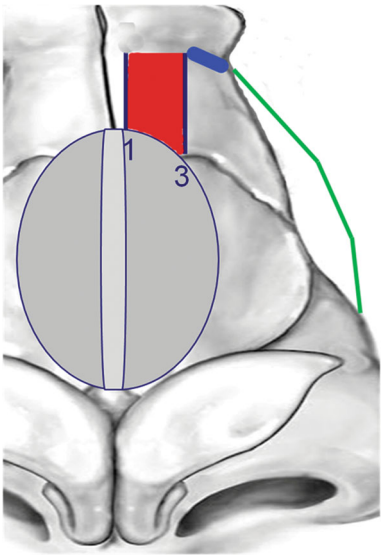

Fig. 5 Line drawing of type II osteoectomy: The *red area* is the bone segment that has to be removed. *Line 1* represents the direction of a medial osteotomy and *line 3* the direction of a lateralized paramedial osteotomy. The *green line* represents the lateral osteotomy, whereas the *short blue line* is the area of the manually inflicted fracture

scars were recorded in any other patient, and all bone fractures were very well consolidated. Representative clinical results of patients, who underwent type I (Figs. 6, 7, 8, 9, 10), and type II osteoectomy (Figs. 11, 12), are displayed.

Discussion

Nasal osteotomies are performed to correct deformities of the bony part of the nose [1, 2, 7]. As a result, they are of utmost importance in the majority of rhinoplasty procedures. Lateral osteotomy and medial osteotomy and its variations (paramedial, medial oblique, etc.) represent the most commonly performed types of osteotomy [1, 2, 8].

Medial osteotomy is performed through the nasal bone between the bony septum and the ascending process of the maxilla and carried superiorly to meet the frontal bone close to the upper end of lateral osteotomy. Depending on its angle, medial osteotomy is also characterized as paramedial, paramedial oblique, medial oblique, etc. Medial osteotomy combined with lateral osteotomy facilitates medialization of the lateral nasal wall, thus achieving open roof closure, as well as effective narrowing of the wide nasal base, even in the absence of a hump [2, 9]. Currently, the more commonly used types of medial osteotomy are the medial oblique and the lateralized medial oblique [10, 11]. As a rule, all types of medial osteotomy are performed with an osteotome. However, it is well known that the use of an osteotome, especially at this area, has certain drawbacks [3, 12]. First, the osteotome may deviate unpredictably during its hammer-induced advancement through the nasal bone and inflict serious trauma. Second, it is difficult to maintain precise control over its accurate placement and direction in this confined area. Third, brittle nasal bones may shatter rather than cut smoothly. Finally, proper use of the osteotome demands high skills, as well as a lot of time to fully master [3]. The aforementioned drawbacks, except for trauma infliction to surrounding vital structures, may also lead to nasal surface irregularities, as well as in misplaced bones resulting in postoperative nose contour deformities [13, 14].

In search of additional innovative techniques in rhinoplasty [15], we have tried to develop an approach that can diminish the aforementioned drawbacks. The theoretical basis for the development of the suggested technique was based on the critical role of a wedge-shaped segment of the nasal bone next to the nasal septum (Fig. 12). Poor handling of this bone segment, due to incorrect performance of medial osteotomies, triggers certain mechanisms that lead, directly or indirectly, to the following nasal contour deformities during the process of medialization of the nasal sidewall (Fig. 13): (1) Predisposes to caudal fracture of the nasal sidewall, which results in collapse of the medial vault and therefore to inverted V or depressed nasal sidewall deformity; (2) prevents medialization of the nasal sidewall, thus resulting in open roof deformity; and (3) acts as a pivot, causing rocker deformity [14, 16].

In reviewing the literature pertinent to proper management of the aforementioned nasal bone area, a limited number of articles were identified. All of them suggested the implementation of a type of medial osteoectomy instead of osteotomy with the use of an osteotome or a saw. Moreover, all of them were exclusively applied for the management of a broad nasal vault. Gerarchi and Mendelsohn first report the removal of a wedge (triangular)-shaped segment of nasal bone, with its base situated at the caudal end of the nasal bone immediately adjacent to the bony septum and its apex at the nasofrontal angle near the midline. With the use of a 2-mm unguarded osteotome, two different types of medial osteotomies are performed. The first osteotomy is performed parallel and immediately adjacent to the bony septum toward the nasofrontal angle. The second osteotomy is commenced more lateral on the caudal end of the nasal bone but directed toward the apex of the initial osteotomy, resulting in a wedge of bone that has to be excised. The width of the excision is dependent upon the amount of dorsal narrowing required [4]. An

Fig. 6 This patient underwent hump removal, septoplasty and type I osteoectomy

Fig. 7 This patient underwent hump removal, septoplasty and type I osteoectomy

Fig. 8 This patient underwent hump removal and type I osteoectomy

Fig. 9 This patient underwent secondary septoplasty and type I osteoectomy

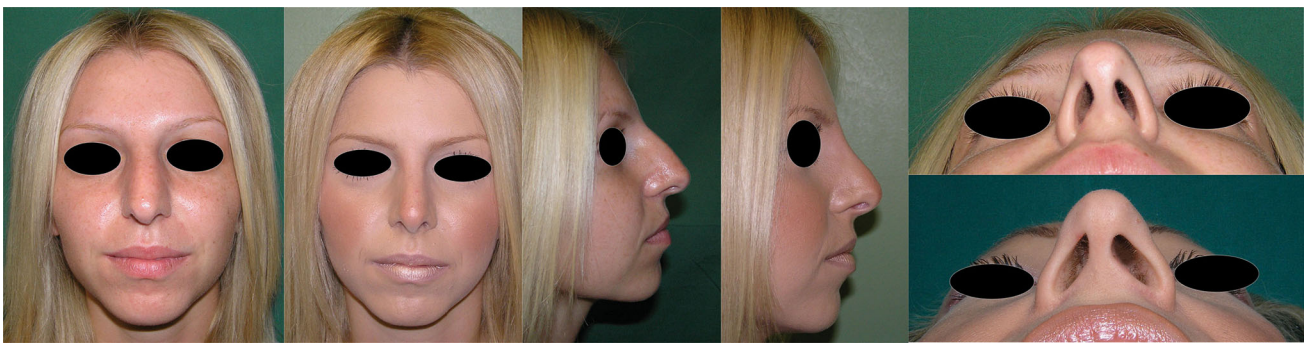

Fig. 10 This patient underwent hump removal and type II osteoectomy

Fig. 11 This patient underwent only type II osteoectomy

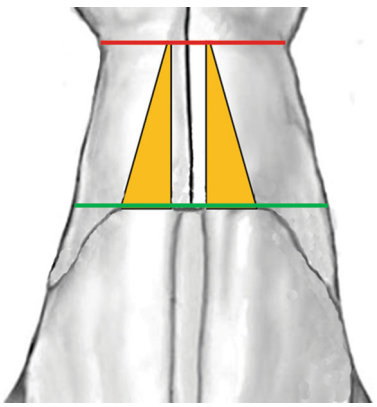

Fig. 12 Line drawing of the *triangular-shaped*, critical segment of the nasal bone: It extends from the intercanthal line (*red line*) to the distal end of nasal bone (*green line*)

almost identical technique is reported by Harris and Baker [9]. Cakir et al. [6] also reported removal of a similar wedge of nasal bone with the use of a thin saw instead of an osteotome. However, the use of the saw results in the creation of an important amount of bone debris, which has to be carefully removed to avoid potential nasal contour irregularities. In addition, this procedure is technically difficult to perform and prolongs significantly the operating time. Cohran et al. [1] recommended the removal of a trapezoid-shaped bone segment intervening between a medial and a paramedial osteotomy with the use of a traditional osteotome. The technique is exclusively applied for the management of a wide nasal vault and always requires an additional transverse osteotomy to medialize the lateral nasal wall in a predictable and safe manner. Finally, Shah and Constantinides suggest removal of a portion of medial nasal bone to allow for appropriate narrowing of the nasal bridge in case of an excessively wide nasal vault. Although the use of an osteotome is mentioned, there is no information regarding the shape of the removed bone segment [17].

Definitely, power-driven instrumentation has nowadays become an attractive alternative to traditional bone removal tools in rhinoplasty. Guyuron first reported successful use of the shielded cutting burr for deepening of the nasofrontal angle in the late 1980s [18]. Ever since, a wide

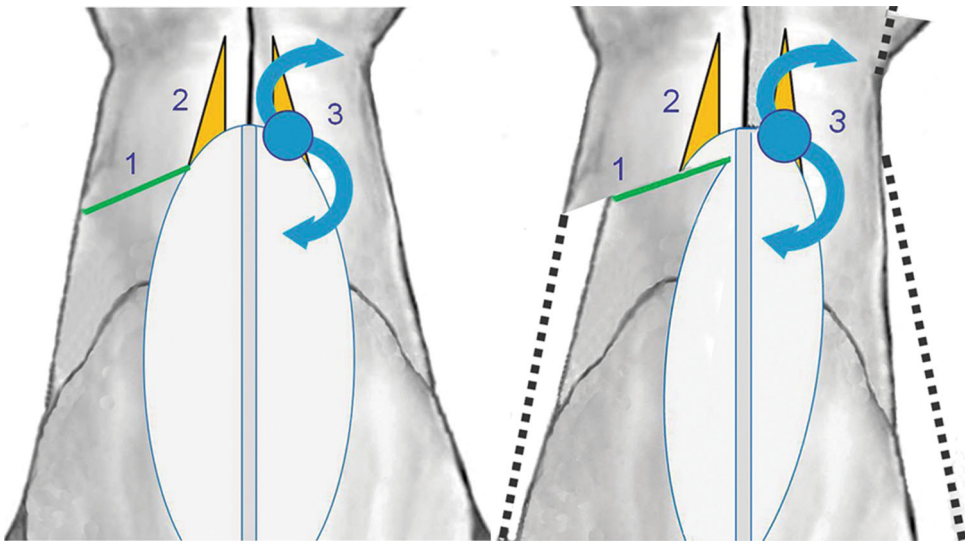

Fig. 13 Line drawing depicting the nasal deformities related to poor handling of the critical nasal bone triangle. The mechanisms activated are *1* Caudal fracture of the nasal sidewall (*green line*), *2* prevention of open roof closure (*yellow triangle*), *3* pivoting around (*blue arrows*) the caudal area (*blue circle*) of the triangle (*left*). The consequences of the aforementioned mechanisms are *1* Inverted V or depressed nasal sidewall deformity, *2* open roof deformity. *3* rocker deformity. The *dashed lines* represent the nasal sidewall prior to its medialization (*right*)

spectrum of guarded cutting burrs, reciprocating power rasps, micro-power saws, and piezosurgery devices, with and without suction and/or irrigation have been commercially available for use in cosmetic rhinoplasty. Their main advantages are precise, smooth, and uniform bone removal, as well as infliction of minimal tissue trauma, which makes them more suitable for use in brittle nasal bones, or revision cases. However, the price of those devices is high, and that is most likely their main disadvantage [19–21].

In this article, we report our experience with implementation of medial osteoectomy using a pair of pliers, as a routine procedure, instead of medial osteotomy with an osteotome. The evolution of the surgical technique is practically based on the specific characteristics of the pliers used. Their double joint design provides maximum reach even into the tightest and narrowest of spaces. The aligned serrated inner surfaces of their jaws ensure precision gripping. Finally, the combination of the shortened jaws with the double joint increases significantly the torque, thus amplifying the crushing forces and allowing for precise crashing and easy removal of the bone gripped. Bone removal can be performed either in one piece, or several pieces. Prior to bone removal, meticulous detachment from the bone of both the nasal mucous membrane and periosteum should be performed with a freer dissector, to prevent potential bleeding and avoid nasal bone shattering, respectively. Practically, the smaller the piece of bone engaged, the easier it is crushed and removed. Also, removal of small pieces of bone at each pass ensures high precision and consistent plane, thus avoiding contour irregularities. Medial osteoectomy in combination with low-to high lateral osteotomies minimizes the unfractured superomedial segment of the lateral nasal wall. Therefore, slight digital pressure is more than enough for medialization of the nasal sidewall. As a result, no transverse osteotomies are needed. According to the aforementioned characteristics of the pliers, as well as the technical details suggested, accurate control on both the exact location and the extent of nasal bone removal is ensured. In addition, complications associated with the use of traditional osteotomes are prevented.

Depending on the aim, two different types of osteoectomy (I and II) are suggested. Type I osteoectomy is performed to facilitate closure of the open roof following hump removal. The shape of bone removal for type I osteoectomy is that of an isosceles trapezium located at the outermost area of the horizontal part of the nasal bone. In this type of osteoectomy, one pass is usually enough, because the shape of the jaws of the pliers is that of an isosceles trapezium. In this way, sliding of the lateral nasal wall under the nasal bone toward the midline is facilitated. Therefore, closure of the open roof is easily achieved. Type II osteoectomy is performed for the management of a wide nasal dorsum, with or without hump removal. A rectangle trapezium-shaped segment of the nasal bone, located between the lines of a medial and a lateralized paramedial osteotomy, must be removed. Removal of the aforementioned bone segment requires at least two passes with a different angle of approach of the pliers. Upon completion of bone removal, drastic medialization of the lateral nasal wall, and therefore wide nasal dorsum repair, is ensured. Moreover, the technique can be applied on an individualized basis, regarding the location and amount of the nasal bone that has to be removed, and on the basis of the specific needs of the patient and the judgment of the surgeon. For example, in case of asymmetric nasal bones and broad bony pyramid, type I osteoectomy on one side and type II on the other can be performed to ensure both symmetry and nasal base narrowing.

Conclusions

In conclusion, medial osteoectomy with the use of pliers is suggested in rhinoplasty procedures, as an alternative of medial osteotomy with the traditional osteotome and hammer. The suggested technique has certain advantages, which in summary are the following: a. It is easy to perform, b. has a short learning curve, c. provides high accuracy over the location and amount of the nasal bone to be removed, and d. inflicts minimal trauma. As a result of the aforementioned advantages, the risk of postoperative complications is low, and most importantly, reliable, consistent, and aesthetically pleasing results are ensured.

Compliance with Ethical Standards

Conflict of interest The authors have no financial interests to disclose.

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