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Review Article

Different surgical treatments for nasal septal perforation and their outcomes

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Abstract

Objective: To critically evaluate the literature on surgical treatment options for nasal septal perforations and to analyse the outcomes of these treatment options.

Design: A systematic review of studies of nasal septal perforation closure using surgical intervention, published from January 1975 to March 2006.

Data sources: Forty-nine papers were identified from electronic databases (all Evidence Based Medicine reviews (Cochrane Database of Systematic Reviews, American College of Physicians Journal Club, Database of Abstracts of Reviews of Effectiveness and Cochrane Controlled Trials Register), EMBASE, Ovid (Medline) and *British Medical Journal* publications) and from a hand search of the reference lists of retrieved papers. Textbooks pertinent to the subject were referred to for background reading. Twenty-three studies met the inclusion criteria.

Main outcome measure: Effectiveness of the surgical intervention to completely close the perforation.

Results: Five studies examined the sole use of intranasal mucosal flaps to close the perforation, i.e. inferior turbinate flaps, quadrangular cartilage flap and mucoperiosteal flap. Eighteen studies reported the use of a combination of intranasal mucosal flap and interposition graft. Graft materials included temporalis fascia, mastoid periosteum, nasal septal material, acellular human dermal graft, conchal cartilage and porcine small intestine mucosa. Studies utilising interposition grafts generally produced higher closure rates. The surgical approaches documented include closed endonasal, unilateral hemitransfixion, external rhinoplasty and midfacial degloving techniques. A range of surgical treatment methods was reported in the literature, but some papers were excluded from this review as they did not meet the inclusion criteria. It was difficult to infer the true effectiveness of each study as the subject numbers were small, patient selection criteria were often unspecified and the follow-up period was brief. However, factors leading to an increased chance of success were identified.

Conclusion: The review found an extensive range of surgical treatment techniques, but reported results were rarely statistically significant. It is difficult to be categorical about the effectiveness of a surgical treatment method; nonetheless, each technique has its own advantages and drawbacks.

Key words: Nasal Septum, Perforation; Rhinoplasty; Outcome Measures

Introduction

Over the years, many surgical techniques have been proposed for closing nasal septal perforations. However, the fact that there is no agreement on which method to use reflects the shortcomings of each one.[1] In fact, most perforations remain unclosed because available closure techniques are technically difficult and require training and experience to master. Perforations are also hard to resolve surgically as all three distinct layers of the nasal septum – the two mucoperichondrial and the one cartilaginous – must be repaired.[2] Many authors have described high success rates with their techniques, but these results are not reproducible by all surgeons.[3,4]

We therefore performed a systematic review to explore the different surgical treatment options available for the closure of nasal septal perforations, and their outcomes.

The incidence of nasal septal perforation is estimated at 1 per cent.[5] The most common cause is iatrogenic following classic Killian sub-mucous resection (post-operative perforation rate of 17–25 per cent) and septoplasty (post-operative perforation rate of 1.4–5 per cent).[6] Cryosurgery, cautery for epistaxis, nasal intubation, over-the-counter decongestants, nasal steroids and, more recently, beclomethasone dipropionate nasal spray[7] have all also been implicated as iatrogenic causes of nasal

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septal perforation. Substance abuse with cocaine is increasingly found to be an aetiological factor[8,9] due to the drug's vasoconstrictor effect on the septal mucosal blood supply. Other causes include trauma, digital manipulation, inflammatory diseases (such as Wegener's granulomatosis, lupus erythematosus and midline lethal granuloma), neoplasms and infectious diseases (such as syphilis and tuberculosis).[10]

Symptoms in patients with nasal septal perforations are attributable to a physiologic disturbance in nasal airflow. Instead of the normal, parabolically shaped lamellar flow, the perforation creates turbulent flow, with a resultant decrease in the normal humidification process, resulting in crusting and desiccation of the affected area.[11] Such symptoms include whistling, epistaxis, crusting with obstruction, malodorous discharge and paranasal pain.[10] The most symptomatic perforations commonly involve the anterior cartilaginous portion of the septum and are large in size. Posterior perforations tend to be less symptomatic because of the rapid humidification of the inspired air by the nasal mucosal lining and turbinates.[1,10,12,13]

Patients with asymptomatic septal perforations are often not treated.[12,14] For symptomatic patients who opt for a more conservative treatment, particularly those with active systemic diseases and those who are poor operative risks, the options include nasal irrigation to prevent dryness and Silastic® septal obturators to limit turbulent flow. Unfortunately, both methods have their shortcomings. The option of operative closure of nasal septal perforation hence provides a more definitive and permanent solution.

Method

A systematic review was performed which aimed to include all studies of the surgical treatment of nasal septal perforations published from January 1975 to March 2006. An initial broad search of the databases of all Evidence Based Medicine reviews (Cochrane Database of Systematic Reviews, American College of Physicians Journal Club, Database of Abstracts of Reviews of Effectiveness and Cochrane Controlled Trials Register), EMBASE, Ovid (Medline) and *British Medical Journal* publications was performed, identifying all articles pertinent to the topic of 'nasal septal perforation'. Relevant articles focusing on the management of nasal septal perforation were then singled out and reviewed. Next, a hand search was conducted of the reference lists of all retrieved papers to identify any additional studies missed during the database searches. Non-English language publications and unpublished studies were both excluded in this systematic review.

The inclusion criteria for case studies were: a population size of at least six patients; symptomatic nasal septal perforations of any size; surgical intervention with the stated aim of complete closure of the perforation; and a follow-up period to identify any reperforations. The primary outcome of interest was the effectiveness of the surgical intervention in completely closing the perforation, thus restoring normal nasal physiology and preventing any recurrence of previous symptoms. The secondary outcome of interest was the surgical approach used to gain intranasal access to the site of perforation.

The literature search failed to reveal any study containing level one evidence (i.e. evidence from a systematic review of all relevant randomised, controlled trials, or from an individual randomised, controlled trial), level two evidence (i.e. evidence from a systematic review of cohort studies or from an individual cohort study) or level three evidence (i.e. evidence from a systematic review of case–control studies or from an individual case–control study), for the timeframe specified. These criteria were based on the categorisation of levels of evidence by the Oxford Centre for Evidence-based Medicine. Hence, the databases of all Evidence Based Medicine reviews elicited no search results. Although there was a multitude of case reports, many were not taken into account as they failed to meet the minimal inclusion criteria of this review.

Results

Twenty-three case series studies were identified, with a number of distinct operative methods. In each study, there were four variable elements: (1) size of perforation; (2) design of endonasal mucosal flap; (3) incorporation of interposition graft, and the source of this graft; and (4) surgical approach. To enable effective comparison of the diverse combinations studied, we initially attempted to group the studies according to perforation size (i.e. 0.5–2, 2–4 and >4 cm). However, the differing size categories used by the individual studies made it impossible to use this method of comparison.

We therefore decided to group the studies into the following two distinct categories: studies that solely used local mucosal flaps to close the perforation, and studies that used both local mucosal flaps and interposition grafts.

Group one: local mucosal flaps only

Although a variety of flaps were described in the literature, only a limited number of studies used local flaps as the sole means of closure. Most studies included very few subjects and were thus excluded from this review, as the inconsistent reporting of relevant data made it difficult to draw conclusions as to the effectiveness of such flaps.

Table I gives details of the few studies that met our inclusion criteria.

Group two: local mucosal flaps and interposition grafts

Fairbanks and Chen (1970)[18] were among the first to report on the use of an interposition graft between sutured septal flaps. The high success achieved (95 per cent closure) led many to experiment with different graft materials. Table II illustrates the studies that used this method of closure.

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TABLE I

STUDIES USING ONLY LOCAL MUCOSAL FLAPS TO CLOSE PERFORATIONS

Study	Flap	Approach	Patients (*n*)	Perforation size (cm)	Follow up	Closure rate (%)
Friedman *et al.*[3] (2003)	Unilateral/bilateral inferior turbinate pedicled flap	Closed endoscopy	10	1.5–3	18 mth – 3 yr	70
Murakami *et al.*[15] (1999)	Unilateral/bilateral inferior turbinate flap	Unspecified	8	1–6.25 cm^2	Unspecified	37.5
Vuyk & Versluis[4] (1988)	Inferior turbinate flap	Unspecified	31	<0.5 to >1.5	Unspecified	30.3
Sarandeses-Garcia *et al.*[16] (1999)	Backwards extraction-reposition of quadrangular cartilage	Closed endoscopy	25	<1	Min 2 yr	92
			5	1–2	Min 2 yr	60
Romo *et al.*[17] (1988)	Bilateral, posteriorly based unipedicled mucoperiosteal flap	Midfacial degloving approach	24	>3	1–3 yr	75

Mth = months; yr = years; min = minimum

From the tables, it is clear that any attempt to compare the effectiveness of the different methods available would be futile, since all the studies reported were non-identical in their variables (e.g. surgical approach, flap and graft material). It is interesting to note that none of the studies contained level one to three evidence. Hence, to date, no high level evidence-based surgical treatments exist for nasal septal perforations of different sizes and locations.

Discussion

It is impossible to confidently comment on the value of a particular surgical method, based on the results presented above, as each study included a small number of subjects and the outcome rates were not statistically significant. The period of follow up varied greatly between studies. A study reporting a 100 per cent closure rate after a short follow-up period might show a less favourable result after longer follow up. The selection of patients was variable and may have influenced the success rates. For example, some authors specified selection of patients based on the cause of nasal septal perforation, and did not include patients with chronic inflammatory processes or cocaine abuse in their studies.

Many studies reported the use of sensible surgical methods but had to be excluded from this review due to lack of follow up, inconsistency of surgical technique reporting and small patient numbers.

However, there were identifiable factors that undeniably contributed to the success or failure of a particular method. In the following section, we discuss these factors and attempt to link them with the results presented above.

Local mucosal flaps only

For studies using local mucosal flaps only (group one), the main factor contributing to a high closure rate was the choice of a flap design which suited the nasal septal perforation. This choice was dependent on: (1) perforation location (i.e. anterior or posterior);[3,16] (2) perforation size (the perforation size is inversely proportional to the amount of viable mucosa available to be used as a flap);[3,16] (3) ability to preserve the flap's vascular supply;[3,9,28,33] and (4) availability of viable intranasal tissue to be used as a flap.[3,34] The flap design itself may be unilateral or bilateral, unipedicled or bipedicled, and anteriorly or posteriorly based (depending on the flap's blood supply and the perforation location). Flap rotation can result in areas of septal exposure adjacent to the perforation site, but unilateral flaps have the advantage, compared with bilateral flaps, of limiting this exposed area to one side of the nose.[27] However, bilateral flaps supply an additional layer of support, provided that the sutures on the contralateral side do not lie in the same plane[27,35] and that a good mucoperichondrial blood supply to the remaining exposed cartilage is preserved.[35] Bipedicled flaps have a better blood supply due to their dual attachments,[35] but they cannot be advanced far, compared with unipedicled flaps.[24]

Numerous flap designs have been described in the literature. All attempt the advancement or rotation of well vascularised local flaps from adjacent areas, including the nasal septum, floor, lateral wall, turbinate, labial mucosa and nasolabial areas.[11] Unfortunately, most of these studies did not meet the minimum inclusive criteria of this review and had to be excluded. The more commonly studied flaps included rotation of the inferior turbinate and advancement of the septal mucoperichondrium or nasal floor mucoperiosteum. The inferior turbinate flap was employed by Friedmann *et al.*,[3] Murakami *et al.*,[15] and Vuyk and Versluis.[4] In theory, the inferior turbinate flap boasts an abundant vascular supply (due to its dual blood source from the descending branch of the sphenopalatine artery and, anteriorly, from the angular artery),[15] the possibility of a wide arc of rotation[3] and the ability to preserve cartilaginous blood supply.[35] However, none of these studies yielded a high closure rate, and the reasons for this failure were not given. Post-operative

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TABLE II

STUDIES UTILIZING LOCAL MUCOSAL FLAPS AND INTERPOSITION GRAFTS TO CLOSE PERFORATIONS

Study	Flap	Interposition graft	Approach	Patients (*n*)	Perforation size (cm)	Follow up	Closure rate (%)
Belmont[19] (1985)	Bilateral, posteriorly based mucoperichondrial/ mucoperiosteal flap	Temporalis fascia graft	Closed endonasal	6	2–3 Anterior	1 yr	100
Arnstein & Berke[9] (1989)	Bilateral, bipedicled mucoperichondrial flap	Temporalis fascia graft	Open rhinoplasty	9	2–3.5	1–3 yr	88.9
Mina & Downar-Zapolski[20] (1994)	Unilateral, mucoperichondrial/ mucoperiosteal rotational flap	Temporalis fascia graft on contralateral side	Unilateral hemitransfixation	14	0.5–3	6 mth to 10 yr	92.9
Núñez-Fernández *et al.*[21] (1998)	Mucosal flaps (details unspecified)	Temporal fascia graft with bone (perpendicular plate of ethmoid bone or mastoid cortex)	Closed endonasal	9	8 cases <3 1 case >3	18 mth to 4 yr	88.8
Fairbanks & Fairbanks[22] (1980)	Unilateral/bilateral, bipedicled mucosal flaps	Temporalis fascia graft or cranial periosteum or thin septal bone	Closed endonasal	24	1–3	1–7 yr	95.8
Teichgraeber & Russo[12] (1993)	Superior and inferior bipedicled flaps with a contralateral posteriorly based mucoperiosteal flap	Temporalis fascia graft or mastoid periosteum	External rhinoplasty	22	0.5–4 Posterior	Min 1 yr	86
Romo *et al.*[23] (1995)	Rotated nasal floor flap (skin graft to cover denuded nasal floor donor site)	Mastoid periosteum	Midfacial degloving (with long term nasal mucosal expansion)	5	3.4–4.5	1 yr	100
	Rotated nasal floor flap (skin graft to cover denuded nasal floor donor site)	Mastoid periosteum	Midfacial degloving	6	2.6–4.2	1 yr	67
Kridel *et al.*[24] (1986)	Unilateral/bilateral, bipedicled mucosal flaps	Mastoid periosteum, cartilage, ethmoid bone	External rhinoplasty	22	<4	Unspecified	77

Kridel *et al.*[25] (1998)	Mucoperichondrial flap	Acellular human dermal allograft	External rhinoplasty	12	0.5–4.5	3–14 mth	92
Romo *et al.*[10] (1999)	Bilateral, posteriorly based mucosal flap	Acellular human dermal graft	External rhinoplasty	14	0.5–2.0	Unspecified	92.9
	Bilateral, posteriorly based, expanded mucosal flaps	Acellular human dermal graft	Midfacial degloving technique	22	Minimum 2	1 yr	81.8
Ayshford *et al.*[26] (2003)	Unilateral/bilateral, inferior turbinate pedicled flap	Acellular human dermal allograft	Closed endonasal	17	1–2.5 Anterior	Unspecified	76
Newton *et al.*[27] (2003)	Unilateral, bipedicled submucoperichondrial & subperiosteal flap	Septal bone or temporalis fascia graft (if septal bone unavailable)	External rhinoplasty	12	<2	6–22 mth (mean 10 mth)	90.9
Seda[28] (1977)	Superiorly based mucosal flap	Composite mucoperichondrial/ mucoperiosteal graft (remains attached to the outlined mucosal flap)	Unspecified	6	Unspecified	Unspecified (longest for 3 yr)	67
Woolford & Jones[29] (2001)	Unilateral, posteriorly based mucosal flap	Conchal cartilage graft	2 cases with open rhinoplasty 9 cases with closed endonasal	11	1–4	3–37 mth (mean 19.8 mth)	72.7
Hussain & Kay[30] (1992)	Bilateral, inferior turbinate mucoperiosteal flap	Tragal cartilage	Closed endonasal	10	2–4	24 mth	70
Hussain & Murthy[31] (1997)	Mucoperichondrial and mucoperiosteal flaps (details unspecified)	Tragal cartilage–temporalis fascia sandwich graft	Unspecified	15	1–3	6–24 mth	100
Ohlsén[5] (1988)	Cutaneous flap (from nasolabial fold)	Perichondrocutaneous graft (using anterior auricular graft)	Unspecified	28	0.5–2.8	4–8 yr	96.4
Ambro *et al.*[32] (2003)	Bipedicled, mucoperichondrial flaps	Porcine small intestinal submucosa	Open rhinoplasty	10	0.4–2	3–12 mth	100

Yr = year; mth = month; min = minimum

complications included intranasal adhesion formation (between the septum and the inferior turbinate), crusting and scarring causing nasal obstruction.[4,31] The inferior turbinate flap involves a two stage procedure[3,4,26] whereby patients must return for a second operation to release the pedicle of the inferior turbinate. The abundance of inferior turbinate tissue makes it a robust, reliable flap; however, at the same time, it also has enough bulk to cause partial obstruction of the airway.[3] The inferior turbinate flap has a high failure rate, and Murakami *et al.* suggested that it should not be used as first line treatment but, rather, should be used in patients with scarred and friable tissues that preclude the use of adjacent mucoperichondrial or mucoperiosteal flaps.[15]

Advancement of mucoperichondrial or mucoperiosteal tissue from the septal wall or nasal floor has been widely documented. However, it was difficult to find studies that used such flaps as the sole means of closing septal perforations, as most authors incorporated interposition grafts in their reported techniques (as shown in Table II). Romo *et al.*[17] described a method using only a bilateral, posteriorly based, unipedicled mucoperiosteal flap, without any grafts, but the closure rate was not satisfactory. Other flaps reported included the nasolabial flap,[5] labiobuccal flap[36] and skin flaps, although the relevant studies were limited to only a few patients and the probability of success was not quantified. Such flaps may be effective in closing the perforation but are non-ciliated and thus can become parched in the nose, as happens in the mouth when exposed to air.[5] This leaves the patient with a dry nose that continues to crust, because normal respiratory tract mucosa is not present.[3,13]

Local mucosal flaps and interposition grafts

The studies in Table II generally reported more promising results than those in Table I. Although no controlled study has ever been done to compare the effectiveness of methods using a sole flap and those incorporating a graft, the higher closure rates shown in Table II suggest that an interposed graft might increase closure rates.

The improved success rates may be due to a number of reasons. The viable intranasal mucosal lining used as a flap can be deficient, resulting in excessive tension on the perforation closure suture line,[23] causing problems such as distal flap ischaemia, anastomosis breakdown and, ultimately, reperforation of the septum.[23] Another disadvantage of simple mucosal flaps is the subsequent shrinkage after rotation.[28] The incorporation of a graft helps to prevent these complications and also serves as a template for mucosal migration as healing occurs.[19,22,25,29] Even if sufficient mucosal lining is present, the rotation of a flap can result in significant and unacceptable donor site morbidity.[23] These can then lead to a recurrence of nasal symptoms. The use of an interposed graft negates this need to close the perforation completely using only a mucosal flap and thus decreases intranasal donor site morbidity.

Similar to the flap diversity seen in group one, many different graft materials have been reported in the literature. However, due to inconsistency of data, many of these studies had to be excluded from this review. The grafts studied and documented included connective tissue autografts (e.g. temporal fascia graft), mastoid periosteum, septal bone, conchal cartilage, acellular human dermal allograft, radial forearm fascial free flap[37] and even porcine small intestine mucosa.[32]

The use of a temporal fascia graft, with high closure rates, has been described by Fairbanks and Fairbanks,[22] Belmont,[19] Arnstein and Berke,[9] Teichgraeber and Russo,[12] Mina and Downar-Zapolski,[20] and Núñez-Fernández *et al.*[21] Fairbanks and Fairbanks attributed this success to the low metabolic requirement of the temporalis fascia and to its action as a framework for ingrowth of new fibroblasts, even when the mucosal flaps did not completely cover the perforation.[22] Belmont also proposed that the temporalis fascial graft acts as scaffolding to maintain closure of the perforation until epithelialisation is complete, while lending strength and durability to the closure.[19] However, the use of this graft material also has its drawbacks, as it is accompanied by donor site morbidity.[16] Despite the fact that the incision can be hidden in the hair or behind the auricle, the temporal fascia flap requires a large scalp incision, is difficult to raise, is at a site distant from the septum and can be difficult to suture into place.[13] Núñez-Fernández *et al.* assessed the risk of a lax post-operative septum due to the thinness of the temporal fascia graft, and they added bone (a perpendicular plate of ethmoid bone or mastoid cortex) to the graft to make it more resistant to reperforation.[21]

Teichgraeber and Russo,[12] Romo *et al.*[23] and Kridel *et al.*[24] harvested mastoid periosteum to cover the perforation. This graft material provides a thin, malleable graft that is similar in consistency to temporalis muscle fascia.[13] However, Kridel proposed that, unlike the fascial graft, periosteum does not curl and is therefore easier to place and to suture between the septal mucosal flaps.[24] Romo *et al.*[23] described the concept of harvesting additional local endonasal mucosa, using long term soft tissue expanders, in addition to using a nasal floor flap and mastoid periosteum, to close the perforation. This technique aimed to increase the amount of nasal mucosa available to be advanced as a flap.[23] The success rate was 100 per cent but the study only included five subjects, and, hence, the reproducibility of these results may be questionable.

Another graft material that has been publicised more recently is the acellular human dermal allograft. Romo *et al.*,[10] Ayshford *et al.*[26] and Kridel *et al.*[25] have reported the use of this graft, with varied results; hence, it is hard to determine whether this graft is indeed advantageous. Nevertheless, this graft has several benefits, including elimination of donor site morbidity, availability in quantities sufficient for all sizes of perforation and

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convenience.[10,26] It is also thicker than other graft materials such as fascia, cartilage or cranial periosteum. Therefore, it is technically easier to handle and avoids production of an excessively flaccid repair.[26]

Many have also experimented with septal bone or cartilage as another choice of supportive tissue. Fairbanks and Fairbanks[22] and Newton *et al.*[27] have reported using septal bone, although it is hard to determine whether the success rates reported in their studies were solely due to the use of septal material as other grafts were also used. Septal graft material can be easily harvested within the surgical field, but its quality and quantity may be limited due to previous trauma.[13] The irony of using a septal graft is that while it closes the perforation, it also deprives the donor site of its cartilaginous support and thus increases the risk of perforation at a new site.[5] In large perforations, it can also lead to structural abnormalities[34] and hence should be avoided. Studies such as those carried out by Woolford and Jones,[29] Hussain and Kay[30] and Hussain and Murthy[31] used conchal cartilage, including the tragus. This causes minimal donor site morbidity, but the conchal cartilage only provides limited tissue[13,31] and hence cannot be used for very large perforations. Hussain and Murthy[31] described a sandwich graft, with the tragus cartilage covered by temporoparietal fascia on both sides. They achieved more success with this arrangement, compared with their original method using just a tragus cartilage.[30] However, it cannot be concluded that this success was solely attributable to the modification of the graft, as different types of flaps were also used in both studies and this may have contributed to the differing closure rates.

Different surgical approaches

The main surgical approaches found in the literature were closed endonasal endoscopy, unilateral hemitransfixation, external rhinoplasty using a transcolumellar incision and the midfacial degloving technique. There was no evidence to suggest that the choice of surgical approach increased a study's success rate. However, there are definite advantages to each approach, and these might play a part in the whole set of interlinking variables which contributes to the ultimate outcome.

The closed endonasal approach is widely used for smaller perforations, as shown in Tables I and II, but its benefits are rarely elaborated upon. Although effective, it is technically more difficult owing to the often limited exposure, particularly for more posteriorly or superiorly extending perforations.[11,12] This suboptimal exposure can also lead to inadequate flap mobilisation and poor flap approximation.[12]

The open approach of external rhinoplasty clearly holds an advantage when it comes to increasing surgical exposure to the nasal cavity, as it permits binocular visualisation of the nasal septum.[9,12,24] An open approach also frees both hands to manipulate the mucosal flaps[10] and allows accurate modelling and suturing of the interposition grafts if needed.[27,38] A cause for concern regarding the external rhinoplasty approach is the columellar scar. However, it is only 5 mm long and is out of the normal line of vision.[9,38] This technique can also lead to post-operative scar contracture and a late nasal tip drop.[35]

The midfacial degloving approach is an effective yet extensive procedure[11] and is generally reserved for perforations larger than 2 cm.[10,17,23] This approach affords unparalleled exposure to the posterior and superior portions of the perforation, where suture repair is technically most difficult and failure most likely to occur.[17] Among its disadvantages are greater intra-operative blood loss, longer operative time, potential injury to the infraorbital nerves, and the potential for vestibular stenosis and asymmetry.[39]

Conclusion

Although a vast number of different surgical techniques are described in the literature, the success rates and feasibility of each method are still open to conjecture. Many studies report high outcome rates, but it is hard to quantify these results since the number of patients involved is usually small, leading to statistically insignificant results. Therefore, it is difficult to determine whether such results are reproducible. The outcome of a surgical treatment is dependent on an interplay of factors: flap design, graft material and surgical approach. The key to success is often a combination of good patient selection, development of a flap with preserved blood supply, incorporation of a graft that gives support and facilitates the healing process, and use of a surgical approach that allows suitable exposure. Each technique holds its own advantages and drawbacks. Therefore, the onus is on the surgeon to weigh the factors contributing to success, as presented above, and to choose a suitable method for each nasal septal perforation they encounter.

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