

# Aesthetic and functional rhinoplasty

Jannis Constantinidis, Jannis Daniilidis

**The authors stress that conservative correction should be the main goal in aesthetic and functional rhinoplasty. The surgeon controls the operative event and must be skilled at manipulating and controlling the dynamics of postoperative healing to achieve long-term functional and aesthetic results.**

The nose serves a variety of different functions, including protection, defence, respiration, humidification and temperature regulation of the inhaled air, olfaction and attenuation of the voice. These functions are reflected in the intimate morphological relationship of the organs of the nose. In addition, the nose is an important structural element of the face as its shape greatly influences cosmetic appearance.

On the one hand, the goal of the functional and cosmetic rhinoplasty is to improve the function of the nose. On the other hand, it is used to alter the shape of the nose to create harmony with the remaining facial features (forehead, cheeks, eyes, and chin). The shape of the nose should never be altered if it may compromise its function. The internal nose is evaluated (the septum, turbinates, condition of the mucosa) before the external nose. An assessment of the nasofrontal angle, nasolabial angle, tip rotation and projection, nasal dorsal profile, width and appearance of the base is helpful. Even more important is the understanding that the nose should be balanced with the remaining facial features, and it should not distract the attention of the observer from the eyes, especially in females.

The impression of a pleasant face results from the harmony of a variety of individual features. The nose, eyes and forehead form the delicate bow of the aesthetic brow line. This line runs along the eyebrow, along the border of the dorsal and the sidewall subunit to the tip-defining point. The nasal tip is defined by an equidistant rhomboid, formed by the tip-defining points, the infratip point (at the transition from the lobulus to the columella) and the supratip point (anterior septal angle). The nasal tip should be a defined feature in the face. In females, a discrete angula-

tion of the supratip, the supratip break, is desired (Figure 1).

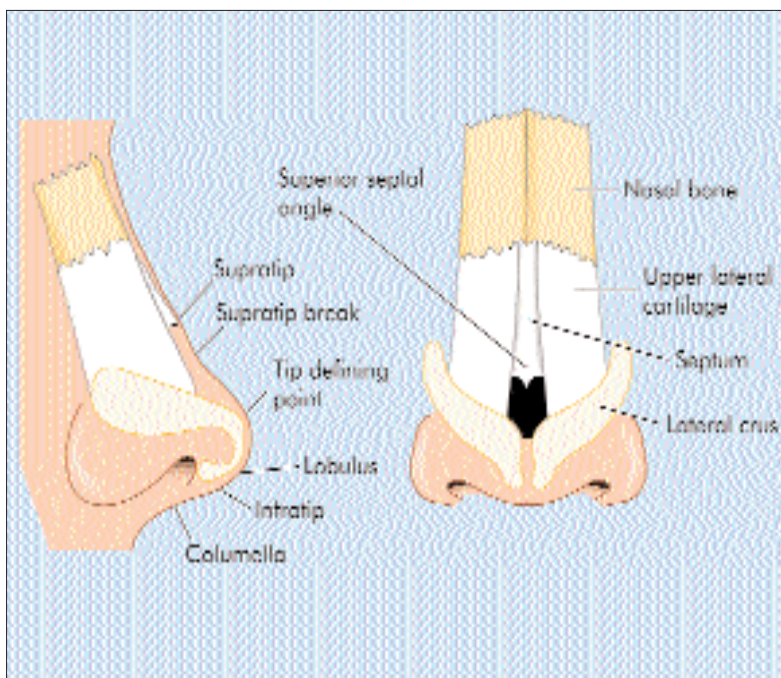
Rhinoplasty is not a uniform operation. No one nose is like another, and there are an infinite number of variations of nasal appearances. Therefore, the choice of a suitable approach and the correct surgical technique necessitates an exact analysis of the individual anatomy with its individual variations and deviations (Tardy et al, 1997). In addition to the texture of the skin and the consistency of the nasal soft tissues, the age of the patient needs to be accounted for.

Before every rhinoplasty it is essential to have a detailed discussion with the patient to learn about his/her preferences and personality. The preoperative visit should address the following questions:

Assistant Professor Jannis Constantinidis is Assistant Professor and Professor Jannis Daniilidis is Professor, Department of Otorhinolaryngology, Head and Neck Surgery, Aristotle University of Thessaloniki, AHEPA-Hospital, 54 006 Thessaloniki, Greece

Correspondence to: Dr J Constantinidis

Figure 1. Anatomy of the nose.



- What are the expectations of the patient, and are they realistic and appropriate?
- Is the result of the procedure going to meet the patient's expectations, and will the patient be satisfied?

Excessive expectations mandate a very clear and detailed explanation of the limits of the procedure, with limiting factors such as specific anatomic details (e.g. thick skin) to be pointed out individually. In general, good patient selection and a good relationship with the patient will help avoid problems in the postoperative phase (Stambaugh, 2001).

### PROFILE CORRECTION

The following anatomical structures are responsible for the profile of the nose: the nasal bones, the cartilaginous septum, the upper lateral cartilages and the alar cartilages. These anatomical structures must be taken into account and matched in a balanced fashion when shaping the profile.

In women, the nasal tip should be some millimeters higher than the nasal dorsum (slight concavity). In men, a straight profile is desired.

When shaping the profile it is necessary to understand that the overall appearance of the nose is shorter after a reduction of the profile or resection of a hump, and that the illusion of a

cephalic rotation of the nasal tip results. In contrast, the placement of a dorsal graft produces the impression of a narrower dorsum without actual alteration to the width of the dorsum. Shortening of the distance between the nasal bones produces the illusion of a decreased intercanthal distance.

The extent of the reduction or augmentation of the profile depends on the projection of the nasal tip. Therefore, every correction of the nasal profile should begin with an accurate definition of the position of the nasal tip. It is also easier to adapt the dorsum to the tip than to adapt the shape and anterior projection of the nasal tip to an already shaped dorsum.

There are three approaches to the nasal dorsum: the intercartilaginous, the transcartilaginous and the open approach. The choice of approach and of the instruments is up to the surgeon and depends on the surgeon's experience and philosophy (Tardy, 1997; Toriumi, 2001).

Presently, microinstruments, in particular 2 mm and 3 mm osteotomes, should be used, since these instruments cause less surgical trauma thereby helping to limit postoperative oedema and enhance wound healing (*Figure 2*).

The removal of a cartilaginous and bony hump can result in irregularities and asymmetries of the dorsum, especially in cases of thin skin. To avoid such complications, the soft tissue envelope should be preserved when undermining the nasal dorsum, and dissected in a subperiosteal plane over the bony dorsum. Also, all fragments should be removed after a hump resection. In cases of thin skin the nasal dorsum may need additional augmentation to prevent irregularities postoperatively.

In such cases the authors have had good experiences with the use of alloderm (LifeCell Corporation, USA). This is an acellular dermal allograft, which is replaced by scar tissue in the postoperative healing phase and acts as a camouflage.

In cases of congenital, traumatic or iatrogenic saddle-nose deformities, it is necessary to augment the dorsum. In the authors' view, autologous graft material, such as septal cartilage, is preferable.

In most cases the septoplasty is performed first, and septal cartilage can easily be harvested and shaped to the appropriate size before augmentation of the dorsum.

In cases of more extensive saddle-nose deformities, multiple grafts of septal or conchal cartilage can be staggered and suture fixated. Care should be taken to avoid irregularities and rough edges, especially in patients with thin skin. A

*Figure 2. (a-c) 26-year-old woman with nasal obstruction, dorsal hump, deviated nose and hanging columella. (d-f) 2-year postoperative result after septoplasty, shortening of the caudal septum and cephalic trim of the lower lateral cartilages. The hump was removed and osteotomies were performed.*



good alternative is calvarial bone and rib (Romo and Jablonski, 1992; Sherris and Kern, 1998) (Figure 3).

Homologous and heterologous transplants have a high rate of resorption and are, in the authors' view, not indicated for nasal augmentation surgery.

Alloplastic implants are equally not advisable since these can get infected even after many years, which may result in extrusion of the implant with necrosis of the surrounding tissues. In such cases the alloplastic implant has to be removed immediately. Revision surgery should be performed with autologous tissue only after the infection has completely subsided.

In general, the reconstruction of a saddle nose is a complex problem. In addition to the aesthetic appearance, the function of the nose needs to be addressed. This requires, in most cases, the reconstruction of the internal nasal valve, an improvement of the projection and skeletal support of the nasal tip, as well as an augmentation of the nasal dorsum (Riechelmann and Rettinger, 2004).

### THE DEVIATED NOSE

Nasal deviations may be distinguished into bony (e.g. after a fracture of the nasal bones) and cartilaginous deviations, although in most cases a combination of a bony and a cartilaginous deviation is present. In cases of cartilaginous deviations, typically the upper lateral cartilages, the alar cartilages and, most frequently, the septum are involved. Alterations and deviations of the septum predominantly in the anterior aspects influence the shape of the external nose. Goldman (1957a) noted 'as the septum goes, so goes the nose.'

Generally, for deviated noses the following principles should be adhered to: the septum should be completely straightened, scars and fibrotic adhesences should be dissected sharply. Defects of the septum should be repaired with grafts.

Splinting of the internal nose and an adequate dressing with a cast of the external nose help preserve the functional and aesthetic result of the surgery.

The nose, depending on the deformity of the septum, can acquire a c-shaped, an s-shaped or a caudal-end deviation. The types of septal deformities, their effects on the shape of the nose and the ways of correcting these deformities have been categorized by Rohrich et al (2002). The principles of correction include: wide exposure through the open approach, release of all deforming forces to the septum, straightening of the

septum, maintaining an adequate dorsal and caudal strut, and restoring long-term support.

The caudal deviation of the nose is a particular problem. Besides the caudal septum, the alar cartilages and the anterior nasal spine are frequently involved. In addition to the aesthetic deficiency, these patients also suffer from nasal obstruction secondary to nasal valve stenosis.

The correction of the bony deformity is performed with osteotomies, which are technically not different from the standard rhinoplasty osteotomies. Besides paramedian, transverse and lateral osteotomies, intermediate osteotomies are frequently employed to correct deviations. When the nasal bones are extremely wide or convex, bilateral intermediate osteotomies may be necessary to obtain adequate narrowing of the bony nasal vault (Larrabee, 1993). In cases of significant deviations, the combination of a lateral and an intermediate osteotomy on the longer side of the nasal pyramid are helpful to establish symmetry. In the authors' experience, wedge resections have not been necessary.

Smaller deviations and depressions of the middle nasal third can be corrected with onlay grafts of morsalized cartilage. It is often safer and more predictable in these cases to simply camouflage the defect. When a collapse of the lower lateral cartilages is present, the placement of spreader grafts between the septum and the upper lateral cartilages is indicated and warrants good functional and aesthetic results (Sheen, 1998).



Figure 3. (a-b) 19-year-old girl with congenital saddle-nose deformity. (c-d) 3-year postoperative result after augmentation of the dorsum with autologous rib cartilage.

## SURGERY OF THE NASAL TIP

Surgery of the nasal tip is a difficult part of rhinoplasty since it contains mobile anatomical structures that are subject to the dynamics of wound healing and ageing.

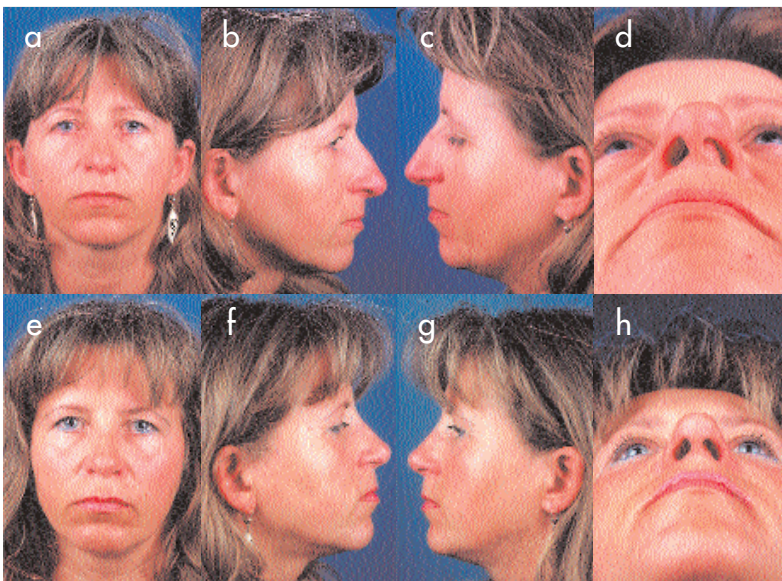
In order to understand the dynamics of wound healing of the nasal tip, the tripod concept (Anderson, 1986) has proved to be a helpful didactic tool. The lateral crura of the alar cartilages form two legs of the tripod, the conjoined medial crura forming the third leg. Resection of the medial crura or dissection of the membranous septum of the caudal edge of the septum result accordingly in decreased projection and skeletal support of the nasal tip and tip ptosis. On the other hand, resection of the cephalic aspects of the lateral crura or the placement of a columellar strut will rotate the tip and improve tip projection.

For didactic reasons various indications for nasal tip surgery can be named (Table 1). Of course, more than one manoeuvre can be applied, and is frequently indicated, to correct a tip deformity.

**TABLE 1.**  
Indications for nasal tip surgery

Rotation
Volume reduction
Projection
Asymmetry
Reconstruction

Figure 4. (a-d) 42-year-old woman with nasal obstruction, dorsal hump, deviated nose and broad tip. (e-h) 18-month postoperative result after septoplasty, hump removal, cephalic trim of the lower lateral cartilages and transdomal suture by delivery approach and microosteotomies.



## TIP ROTATION

Rotation of the nasal tip is indicated in the majority of rhinoplasty procedures. In many cases it is achieved while preserving the anatomic continuity of the alar cartilages (Webster, 1975). The extent of the rotation of the nasal tip depends on multiple factors, such as the overall length of the face and the nose, as well as the shape of the nasal tip and the columella.

A transcartilaginous incision is used, which, after retrograde dissection of the vestibular skin, allows to expose and conservatively resect the cephalic aspect of the alar cartilage. In rare cases a vertical dome division is necessary.

The delivery approach provides good exposure of the cephalic and medial aspects of the alar cartilages. Tip rotation is enhanced by a conservative trim of the caudal end of the septum as well as the caudal aspects of the lower lateral cartilages.

## VOLUME REDUCTION OF THE NASAL TIP

To reduce the volume of the nasal tip, a 3-stage approach has been successful in the authors' hands (Table 2). When mild narrowing of the nasal tip is desired a cephalic trim is performed or combined with suture techniques and morsalization of the cartilage of the domes, or with a dome division and suture techniques for moderate and extensive volume reduction of the nasal tip.

For a mild volume reduction a cephalic trim is performed through a transcartilaginous incision. This approach is less traumatic and results in less supratip oedema and enhanced wound healing.

For patients with thin skin and thick, rigid alar cartilages, the cephalic trim is a safe manoeuvre for mild volume reduction of the nasal tip.

For more significant volume reduction the delivery approach is used, a combination of the inter- and infracartilaginous incision, which allows the delivery of the alar cartilages as a laterally- and medially-based bipediced chondrocutaneous flap. In addition to the cephalic trim of the alar cartilages, suture techniques and morsalization of the cartilage are used (Figure 4).

**TABLE 2.**  
Concept for volume reduction of nasal tip

Cephalic trim (mild narrowing)
Cephalic trim with suture techniques and dome scoring (moderate narrowing)
Cephalic trim with dome division (resection) and suture techniques (extensive narrowing)

When the alar cartilages have been exposed, the following question arises: how much cartilage can be resected at the cephalic aspect and how much should be preserved to achieve a good, long-lasting functional result. This will depend largely on the shape, rigidity and structural support of the alar cartilages. In cases of stable cartilages at least 7 mm is left behind, while being very conservative in cases of thin and concave cartilages.

Inter- and transdomal sutures allow controlled narrowing of the nasal tip (McKinney et al, 2000).

In cases of thick skin, in the authors' experience, the application of suture techniques in addition to cephalic trims has been successful. The Goldman technique (1957b) describes a lateral dome division and reapproximation with mattress sutures. The authors have also had good experiences with the modification of the Goldman technique according to Simons (1987), which leaves the vestibular skin intact after dissection from the alar cartilages. The authors only use this technique in cases of thick skin and strong cartilage. In cases of atrophic alar cartilages this technique is limited and can result in tip ptosis, if the remaining skeletal support of the tip is insufficient. Furthermore, a conservative approach should be used in extensive cephalic resections when performing dome divisions to prevent alar collapse. It is also important to clear out the interdomal fatty tissue, especially in cases of bifidity.

In addition to the dome division in cases of broad, quadrangular domes, a small vertical dome excision of no more than 2 mm may be needed. The conservative dome resection in combination with an interdomal suture can achieve good aesthetic results (Simons, 1987).

### TIP PROJECTION

An improvement in nasal tip projection can also be achieved with tip grafts. These transplants are introduced through a small infracartilaginous incision or through an open approach. When a closed approach is used, it is important to dissect a precise pocket and to morselize the edges of the graft to prevent irregularities at the transition from the graft to the nasal tissues. Moreover, it is necessary to be aware that a tip graft alters the contour and projection of the nasal tip, but not its stability and skeletal support. The placement of a tip graft alone without adequate skeletal support is not sufficient. Therefore, tip grafts are routinely combined with a columellar strut. Preferred graft material for tip grafts is septal and conchal cartilage (Constantian, 1992). The transdomal suture can increase the tip projection by an additional 2–3 mm (Tardy, 1987).

### ASYMMETRIES AND RECONSTRUCTION OF THE NASAL TIP

Most asymmetries of the nasal tip are associated with deformities of the septum and the alar cartilages and may be congenital, traumatic or iatrogenic (Byrd, 1998). The reconstruction of the nasal tip is necessary when important anatomic elements have been altered or injured. Asymmetries and defects of the nasal tip are categorized and corrected as described by Sheen (1998).

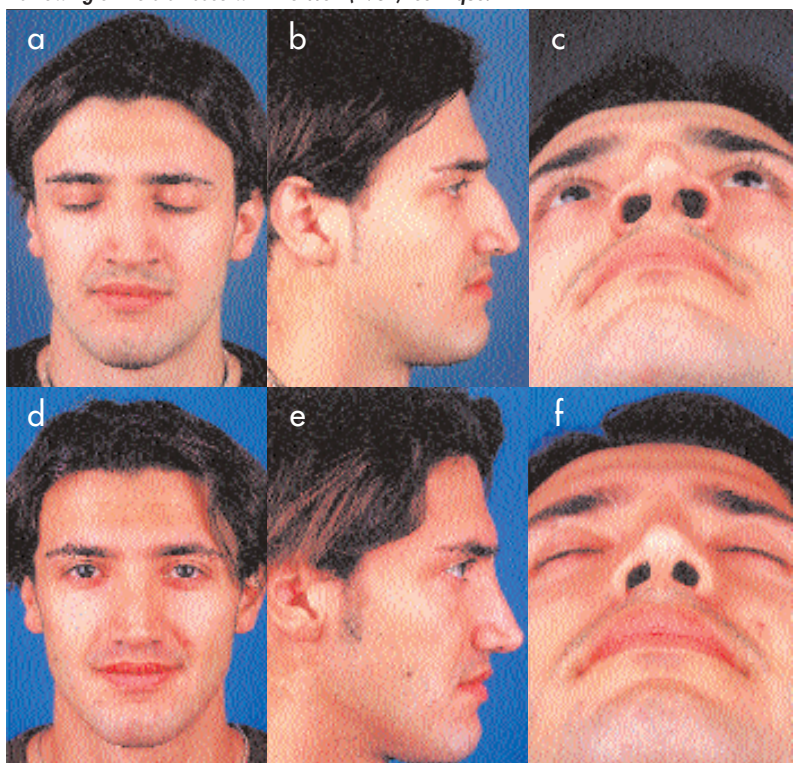
For nasal tip surgery, and for rhinoplasty in general, the consistency of the skin is a very important factor. Thick skin is a limiting factor when the tip is to be narrowed and defined. Good preoperative patient counselling is crucial in these cases. On the other hand, thin skin reveals the smallest irregularity in the nasal tip area and therefore suture techniques are preferred. When excisional techniques are used, a tip graft is recommended for camouflage.

### CORRECTION OF THE NASAL BASE

The shape of the nostrils is variable and ethnic differences become important for surgical correction. In general, the alar width on frontal view is equal to the intercanthal distance.

Corrective surgery of the nasal base in most cases is intended to decrease the width of the alar base and to reshape its form. The extent of

*Figure 5. (a–c) 25-year-old man with nasal obstruction, dorsal hump, deviated nose and width alar base. (d–f) 3-year postoperative result after septoplasty, hump removal, osteotomies and narrowing of the alar base with the Weir (1982) technique.*



the narrowing of the alar base depends on the changes that were made to the projection of the tip, as decreased tip projection typically results in a wider nasal base. Therefore, these changes should be performed at the end of the procedure. Since the first report of alar base resection by Weir (1892), a number of different techniques and modifications have been described (Tardy, 1997) (Figure 5).

## CONCLUSIONS

Aesthetic and functional rhinoplasty is a demanding field. All surgeons involved require good training and an in-depth knowledge of the anatomy and physiology of the nose, as well as an understanding of wound-healing mechanisms.

While functional rhinoplasty concerns improving the function of the nose, aesthetic rhinoplasty is used to alter the shape of the nose to create harmony with the other facial features. A patient's expectations, along with limitations of individual anatomy on outcome, should be fully discussed preoperatively with the physician to avoid complications postoperatively. The authors

stress that conservative correction should always be the main goal and that the shape of the nose should never be altered if there is a danger that it may compromise its function. **HM**

*Conflict of interest: none*

## KEY POINTS

- Knowledge of anatomy and physiology of the nose, as well as an understanding of wound-healing mechanisms is needed to perform nasal surgery.
- A patient's expectations should be discussed in detail preoperatively with the physician.
- Limitations of individual anatomy may alter surgical approach and postoperative result.
- Functional rhinoplasty concerns improving the function of the nose, while aesthetic rhinoplasty is used to alter the shape of the nose to create harmony with other facial features.
- Conservative correction should always be the main goal of nasal surgery.

- Anderson JR (1986) *Rhinoplasty: Emphasizing the external approach*. Thieme Inc, New York
- Byrd HS, Salomon J, Flood J (1998) Correction of the crooked nose. *Plast Reconstr Surg* **102**: 2148–57
- Constantian MB (1992) Distant effects of dorsal and tip grafting in rhinoplasty. *Plast Reconstr Surg* **90**: 405–18
- Goldman IB (1957a) Straightening the deviated nose. *NY State J Med* **57**: 887–92
- Goldman IB (1957b) The importance of medial crura in nasal tip reconstruction. *Arch Otolaryngol* **65**: 143–48
- Larrabee WF Jr (1993) Open rhinoplasty and the upper third of the nose. *Facial Plast Surg Clin North Am* **1**: 23–31
- McKinney P (2000) Management of the bulbous nose. *Plast Reconstr Surg* **106**: 906–17
- Riechelmann H, Rettinger G (2004) Three-step reconstruction of complex saddle-nose deformities. *Arch Otolaryngol Head Neck Surg* **130**: 334–8
- Rohrich RJ, Gunter JP, Deuber MA, Adams WP (2002) The deviated nose: optimizing results using a simplified classification and algorithmic approach. *Plast Reconstr Surg* **110**: 1509–23
- Romo T 3rd, Jablonski RD (1992) Nasal reconstruction using split calvarial grafts. *Otolaryngol Head Neck Surg* **107**: 622–30
- Sheen JH (1998) *Aesthetic Rhinoplasty*. Volume I. CV Mosby Company, St Louis
- Sherris DA, Kern EB (1998) The versatile autogenous rib graft in septorhinoplasty. *Am J Rhinol* **12**: 221–27
- Simons RL (1987) Vertical dome division in rhinoplasty. *Otolaryngol Clin North Am* **20**: 785–96
- Stambaugh KI (2001) Preoperative evaluation of the aesthetic surgery patient. In: Bailey BJ ed. *Head and neck Surgery – Otolaryngology*. Lippincott Williams & Wilkins, Philadelphia
- Tardy ME (1987) Transdomal suture refinement of the nasal tip. *Facial Plast Surg* **4**: 317–25
- Tardy ME ed (1997) *Rhinoplasty. The Art and the Science*. Volume I. WB Saunders Company, Philadelphia
- Toriumi DM, Hecht DA, Emer JJ (2001) External rhinoplasty approach. In: Bailey BJ ed. *Head and neck Surgery – Otolaryngology*. Lippincott Williams & Wilkins, Philadelphia
- Webster RC (1975) Advances in surgery of the tip: intact rim cartilage techniques and the tip–columella–lip aesthetic complex. *Otolaryngol Clin North Am* **8**: 615–44
- Weir RF (1892) On restoring the sunken nose. *NY State J Med* **56**: 449–52