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Effectiveness of chondrofascial 'cigar' graft in contouring the nasal dorsum

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Abstract. Irregularities of the nasal dorsum after rhinoplasty are frustrating for the patient and the surgeon. Different grafts and implants have been adopted to camouflage this nasal imperfection. This study was performed to assess the outcome of a composite chondrofascial 'cigar' graft for contouring an irregular nasal dorsum. Thirty-six patients who underwent rhinoplasty between May 2014 and October 2016 were studied prospectively. The cartilaginous core of the graft was obtained from the septal or conchal cartilage, while the graft outer sleeve was harvested from the right lateral thigh fascia lata. The graft was secured over the nasal dorsum through an external rhinoplasty approach. The patients were followed up for at least 18 months postoperative. All participants were evaluated objectively by two independent rhinoplasty surgeons and subjectively by Rhinoplasty Outcome Evaluation (ROE) score. Donor site morbidity was also assessed. All patients had satisfactory aesthetic results with no apparent irregularities detected over the nasal dorsum. The ROE score improved, from a mean of 20.94 ± 8.67 (range 8–58) preoperatively to a mean of 79.56 ± 10.65 (range 50–96) postoperatively. Insignificant donor site morbidity was encountered, with inconsequential effects. The chondrofascial cigar graft is a reliable method for contouring dorsal irregularities, particularly in patients with thin nasal skin.

Key words: wrapped diced cartilage; nasal dorsal contouring; cigar graft.

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Rhinoplasty operations are one of the most common aesthetic procedures. The achievement of desirable results in such procedures depends on appropriate planning, the tissue characteristics of the patient, and the surgeon's capabilities[1]. Gaining a nasal dorsum with a flattering appearance after rhinoplasty is challenging, as it requires precise preoperative planning, accurate intraoperative implementation, and strict postoperative care[2].

Historically, a depressed irregular nasal dorsum was commonly the result of syphilitic destruction of the bony and cartilaginous support of the nasal dorsum. Over time, the causes of saddle nose have changed, with infectious and toxic causes becoming less frequent. Trauma and primary and secondary reduction rhinoplasties now represent the main causes of these deformities[3,4].

Anatomically, the cartilaginous septum and maxillary crest form the main support of the lower two-thirds of the nasal dorsum. Dorsal irregularities are therefore commonly seen after septal haematomas or abscesses, following fractures of the

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septal cartilage, and in extensive septal surgery[3,4]. Dorsal irregularities are reported to occur in 7–10% of all primary rhinoplasties, which might be troublesome for both the patient and the surgeon, and these irregularities may be particularly problematic for those patients with fair thin skin, which will highlight the underlying imperfection of the nasal dorsum[5,6].

Different grafts and implants are available for the prevention and correction of dorsal nasal irregularities, in the form of autologous, homologous, and alloplastic materials. Cartilage, dermis, temporal fascia, superficial musculoaponeurotic system (SMAS), Vicryl mesh, gelatin film, polytetrafluoroethylene, Surgicel-wrapped diced and crushed cartilage, tensor fascia lata, and acellular dermis are among the most commonly used materials to correct and contour deformities and provide a subcutaneous pad[7]. Each material has certain advantages and disadvantages, but the 'perfect graft' remains the subject of debate. Despite marked improvements in biomedical engineering, the perfect graft is yet to be attained. Clinical studies on this issue are insufficient because of the limitation of objective assessment of the materials, as late evaluation with histopathological studies is almost impossible[7,8].

Fascia is periodically used in rhinoplasty, both in primary and revision cases. There are several reasons for using fascia in rhinoplasty: it is resistant to infection, has a good survival rate, and is easy to shape yet strong enough to be sutured. The fascia also serves as an outer layer and container for diced cartilage and might easily be folded as a lamellated structure, giving the desired thickness needed by the surgeon[9].

The aim of this study was to perform a subjective and objective evaluation of the outcome of the chondrofascial 'cigar' graft technique for contouring of the irregular nasal dorsum.

Patients and methods

This prospective case-series study included 36 consecutive patients who underwent rhinoplasty with a chondrofascial graft in the Otorhinolaryngology Department, Tanta University, during the period May 2014 to October 2016. The study was approved by the institutional ethics committee. Patients were selected as surgical candidates for chondrofascial grafting if they reported a primary concern of nasal dorsal irregularities, either primarily or following previous rhinoplasty procedures, at the initial examination. Patients were excluded from the study if they were younger than 18 years old, had extensive facial scarring, suffered major nasal saddling, had been treated for granulomatous nasal diseases, had sino-nasal tumours, or had a past history of a maxillofacial prosthesis.

A full clinical assessment was conducted, including complete otolaryngological examination and routine investigations for general anaesthesia. Patients were examined using a 0-degree 4-mm endoscope, following which they underwent a facial analysis using photographic documentation in the standard photographic views. All findings were recorded on the patient's preoperative form.

Assessment of the surgical outcome

For the objective assessment, two independent rhinoplasty surgeons were asked to rate the improvement in facial appearance of the participants with respect to the dorsal irregularity through the comparison of the preoperative and 12-month postoperative photographs of the patients. The result was recorded on a visual analogue scale (VAS, 100-mm), with 0 representing the worst appearance and 100 representing the best appearance. The mean values of the two surgeons' ratings were calculated. For the subjective assessment, all of the participants were asked to complete a Rhinoplasty Outcome Evaluation (ROE) questionnaire in full, both preoperatively and at 12 months postoperative[10]. Finally, all participants were asked to respond to a donor site morbidity questionnaire at 12 months postoperative, which inquired about their satisfaction with the thigh scar and whether they suffered any difficulties in ambulation or limping postoperatively.

Surgical procedures

In all cases, a fascia lata graft (average size 2×3 cm) was harvested from the right lateral thigh by performing a 3–5-cm incision located 15–20 cm proximal to the insertion of the tensor fascia lata muscle on the lateral side of the knee joint (Fig. 1). Overlying fat was bluntly dissected off the fascia and the fascia was gently elevated off the underlying muscle using iris scissors. The cartilaginous core of the composite graft was harvested from the septal cartilage if available, while in revision cases with insufficient septal cartilage, conchal cartilage was harvested through an incision in the medial surface of the pinna.

The fascial covering of the graft was spread over a surgical drape while the cartilaginous element was cut into pieces in a customized manner according to the thickness of the graft required by the surgeon: strips of cartilage 3×10 mm were used in cases requiring considerable augmentation, while smaller pieces of crushed cartilage 2–5 mm in size were used if the main objective was contouring of a minor irregularity. The crushed cartilage was then placed over the fascial covering and the cigar-shaped chondrofascial graft was created by suturing the ends of the fascia using 3–0 interrupted polydioxanone (PDS) sutures.

An external approach was used through an inverted V-shaped transcolumellar incision under general anaesthesia. Skin was elevated over the dorsum in a supra-perichondrial plane. After a standard rhinoplasty procedure, the prepared graft was placed in the dorsal pocket dissected supra-perichondrially, where it was manipulated gently until it reached the previously planned position. The transcolumellar incision was sutured closed. The graft was palpated to check its position. External nasal splinting was used to prevent graft displacement and nasal packing was applied.

Statistical analysis

A sample size of $n > 35$ was calculated based on a quasi-experimental trial study design with an expected improvement in outcome of around 70% and with an expected margin of error of 10%. The data analysis was done using IBM SPSS Statistics, version 20.0 (IBM Corp., Armonk, NY, USA). Quantitative data were expressed as the mean ± standard deviation (SD). The paired *t*-test was used to compare the ROE score before and after surgery, and the unpaired *t*-test was used to detect whether there was a difference in ROE postoperatively between male and female patients. A *P*-value of <0.05 was considered statistically significant. The non-parametric Spearman's rank correlation coefficient (r) was used to detect whether there was an association between the subjective outcome measure (ROE postoperative) and the objective outcome measure obtained postoperatively (surgeon assessment VAS).

Results

Thirty-six patients were recruited into the study, 14 male (38.9%) and 22 female (61.1%). Twenty-two were primary cases and 14 were revision cases, with no sta-

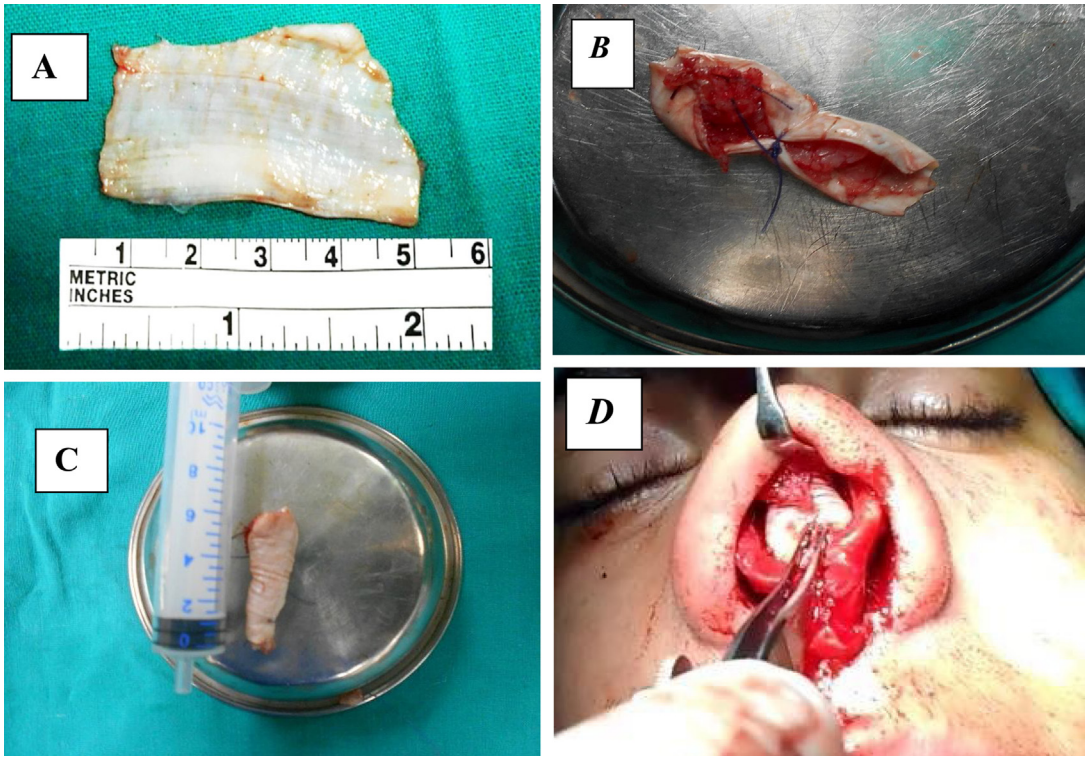

Fig. 1. Steps for the harvest, preparation, and placement of the cigar graft: (A) harvested segment of fascia lata, (B) fascia lata wrapped around a cartilage graft in a cigar-shaped fashion, (C) a prepared cigar graft of suitable length, (D) insertion of the graft through an open rhinoplasty approach.

tistically significant difference in surgical outcomes. Participants ranged in age from 18 to 48 years (mean age 29.33 ± 8.07 years). The average postoperative rating on the VAS for the two surgeons ranged from 60 to 96 (mean 78.86 ± 6.95). All patients showed an improvement in ROE score postoperative (Table 1), with no difference between the sexes.

Thirty-five patients (97.2%) were not bothered by the scar on their right thigh and had not suffered any thigh pain following graft harvest. Only one participant reported a seroma formation, which occurred at 2 weeks postoperative and was managed conservatively. A statistically significant positive correlation was found between the subjective outcome measure (ROE postoperative) reported by the patients and the objective outcome measure (postoperative VAS) as assessed by the surgeons: Spearman's rank correlation coefficient $r = 0.396$, $P = 0.017$ (Fig. 2).

Discussion

The rhinoplasty literature is replete with different kinds of nasal grafts and implants used to contour the nasal dorsum and improve the nasal profile, yet problems of palpable and visible irregularity are still encountered during long-term follow-up[8,9,11]. Crushed cartilage has commonly been used to camouflage the nasal dorsum and conceal mild irregularities, but various studies have shown different degrees of cartilage loss, depending on the crushing strength, with resulting unexpected irregularities and demarcation occurring over time[12]. Fascial grafts were introduced into the field of facial plastic surgery to compensate for such drawbacks[13].

The application of fascial grafts in rhinoplasty was developed with the proposal of wrapping cartilage in temporoparietal fascia[11,13]. The combination of fascia and diced cartilage resulted in smooth edges and prevented 'ski-jump' and 'parrot-beak' deformities. These composite chondrofascial grafts were reportedly soft, nonabsorbable, abundant, and resistant to infection. They provide a smooth and pliable graft material that is ideal for improving both the contour and volume of the dorsum. They also help preclude any long-term concern with graft visibility[13–16].

The use of an autologous fascia lata graft for nasal dorsal contouring and camouflage was first reported by Karaaltin et al., who used the fascia lata graft for dorsal contouring and camouflage in 63 patients[17]. Satisfactory aesthetic results were obtained, with no apparent dorsal irregularities (Fig. 3).

Daniel et al. studied the use of diced cartilage grafts wrapped in temporal fascia

Table 1. Rhinoplasty Outcome Evaluation (ROE) scores before and after surgery; a statistically significant improvement in ROE was seen in the participants.

	ROE	
	Before surgery	After surgery
Range	8–58	50–96
Mean ± SD	20.94 ± 8.67	79.56 ± 10.65
t-test	25.613	
P-value	0.001*	

SD, standard deviation.
* means statistical significance.

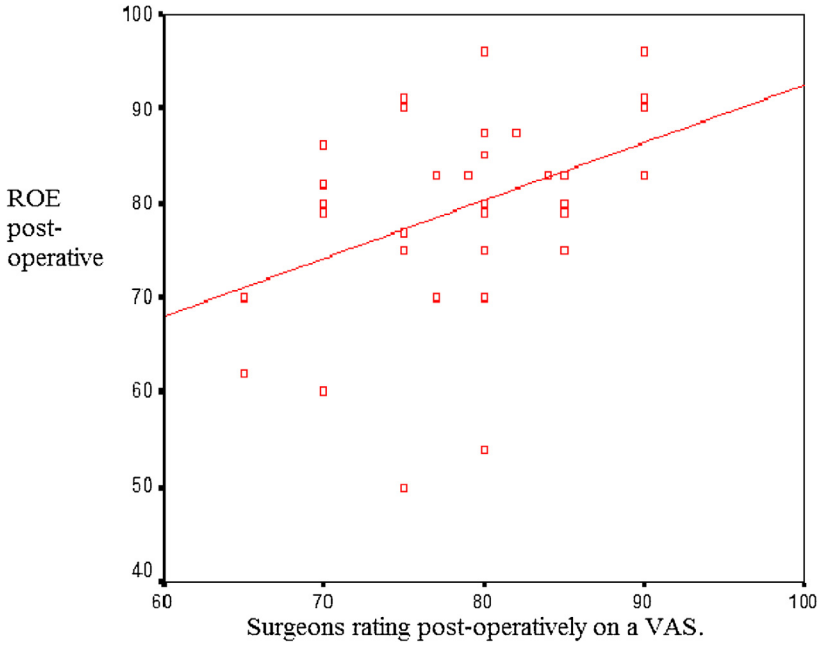

Fig. 2. Spearman's rank correlation coefficient (*r*) showed a statistically significant positive correlation between the subjective outcome measure (ROE) obtained postoperatively (vertical axis) and the surgeons' rating on a VAS (horizontal axis).

in rhinoplasty surgery for 20 successive patients with a minimum of 1 year follow-up[14,18]. They reported proper maintenance of the graft without evidence of graft absorption. In the same field, Baser et al. used diced cartilage wrapped in fascia lata in 32 revision rhinoplasty cases, in which they highlighted the distinct advantages of that composite graft in augmenting the nasal dorsum[19]. These advantages were that the grafts were simple, autogenous, and readily malleable to compensate for dorsal defects of various sizes and positions. Moreover, they reported that over-correction and under-correction were manageable, as the graft could remain mobile for almost 2 weeks postoperatively; gentle digital manipulation of the nasal dorsum followed by steri-strip application for 1 week could be used to maintain the desired nasal profile[19].

Jang et al., as well as other authors, investigated the use of Tutoplast-processed fascia lata (TPFL) as an alternative homograft for nasal dorsal augmentation in rhinoplasty, used either as a separate graft or with a sandwiched cartilaginous core. They reported varying degrees of graft absorption over long-term follow-up and complete absorption in 4.3% of patients. They emphasized that the use of TPFL as a dorsal graft material has some drawbacks. First, there may be concerns about possible transmission of viral or prion diseases. Second, TPFL is expensive and not affordable for all patients. Lastly, and significantly, partial resorption of TPFL may occur; hence TPFL should be regarded as a biological implant of human origin that acts as a spacer until replaced by the body's own tissue[20–22].

On comparing the use of temporalis fascia and fascia lata in the field of rhinoplasty, the first might have the advantage of being readily accessible in the same surgical field, but is associated with the risk of a visible temporal scar, especially in male patients with very short hair. On the other hand, the fascia lata graft has the merits of being thicker, more abundant, and easier to harvest, with the possibility of simultaneous harvest by an assistant while the main surgeon manipulates the nasal procedures, but it has the disadvantages of leaving a thigh scar and the limited ambulation postoperatively[15,17,18].

Recently, several techniques have been developed for fascia lata harvesting with the aim of minimizing donor site morbidity, including the use of strippers and fasciotomies, as well as smaller incisions with subcutaneous elevators and hydrodissection. Endoscopic techniques for the retrieval of fascia lata have also been receiving attention, with satisfactory results published. However, all of these procedures are technically demanding with extra surgical effort required to accomplish complete haemostasis through a limited surgical field[23,24].

A strength of the present study is that both objective (independent surgeon ratings) and subjective (ROE score) measures were used to assess the surgical outcomes. Moreover, Spearman's rank correlation coefficient test was used, which showed a statistically significant positive correlation between the two measures. It was considered that combining the two measures would add credibility to the surgical results, being more representative of the patients' and the experts' levels of satisfaction.

This study introduces the term 'cigar' graft to describe diced cartilage wrapped in fascia. The authors consider this to be more convenient to represent the chondrofascial graft than other synonyms reported in the literature, like bag, sandwich, sleeve, basket and pillow[13–22].

It could be argued that this study is limited by the fact that a control group was not adopted to evaluate the proposed techniques. Nevertheless, it is believed that this limitation does not detract from the statistical results obtained, which confirm the feasibility of the cigar graft in certain rhinoplasty scenarios.

In conclusion, several grafts and implants for contouring the nasal dorsum have been proposed, but autografts remain the gold standard. Due to its physical and biological properties, the chondrofascial cigar graft can be considered a good option that every rhinoplasty surgeon should have in their repertoire.

Fig. 3. Preoperative (top row) 1,2,3,7,8,9 postoperative (bottom) row 4,5,6,10,11,12 of a female patient with thin skin 20 months post-op. with a cigar graft application.

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Competing interests

No conflict of interest to disclose.

Ethical approval

The study was approved by the Institutional Ethics Committee of Tanta University, with approval code 30215/04/14.

Patient consent

All patients gave written consent to take part in the study and for the publication of the clinical photographs.

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