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RHINOLOGY

A new modification of Doyle splint (Hemi-split Doyle) in rhinoplasty with alar base reduction

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Abstract Patients perceive the pulling of a nasal splints as the most feared and stressful part of nasal surgery. Even the incisions made for alar base surgery can partly or entirely dehisce. So, we have been using modified Doyle silicone splints. We compared the modified Doyle silicone splints with conventional Doyle silicone splint. Included in the study were 64 patients undergoing alar base surgery together with open septorhinoplasty. Group 1 ($n = 32$) patients received a conventional Doyle intranasal silicone splint and group 2 ($n = 32$) received modified splint that we call a hemi-split Doyle splint. The pain felt by the patients during the removal of the splints was recorded according to the visual analogue scale (VAS). On days two and four postoperatively, the nasal stuffiness score (NOSE) was recorded. On day four postoperatively an intranasal examination was conducted to establish if dehiscence had occurred on the alar base incision line. In group 2, the pain scores during splints removal were significantly lower than those in group 1. Whereas no dehiscence on the alar base incision line was observed after tampon removal in group 2, the incision dehisced in eight patients in group 1. The NOSE scores on postoperative days two and four showed no difference between the groups. The hemi-split Doyle splint causes less pain during removal and particularly does not lead to dehiscence of incisions made during alar base surgery in rhinoplasty patients.

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Introduction

Rhinoplasty is one of the most common procedures in facial surgery. Alar base surgery is used in the last stage of rhinoplasty to reduce an enlarged alar base. Alar base surgery has been known for a 100 years as a technique that can be applied with rhinoplasty. To date, a large number of alar base reduction techniques have been described [1, 2], and these techniques are based on skin excision after incision and subsequent resuturing.

Nasal packing after endonasal surgery is used according to the choice and experience of the surgeon to staunch the bleeding and to achieve internal stabilization. Whenever it is used, the material applied may also vary widely according to the surgeon. Good nasal packing should be easy to insert and remove. It should be effective while in place and not cause discomfort. Particularly, it should not cause pain when it is removed. Patients perceive the pulling of a nasal tampon as the most feared and stressful part of nasal surgery [3]. As the procedure is painful, some authors have suggested applying suturing techniques instead of nasal tampon or splint after nasal surgery [4].

Many surgeons prefer to use Doyle silicone intranasal splints after rhinoplasty. Splints achieve bleeding control and stabilization and at the same time reduce the incidence of complications, such as hematoma, synechia, infection, abscess formation, and perforation [5]. Silicone intranasal splints provide better support for the nasal dorsum than other packing materials, preserve the mucociliary clearance effectively, and have minimal influence on the functions of the Eustachian tube [6, 7]. For these

reasons, some surgeons suggest the routine use of silicone splints after sinonasal surgery [8, 9]. On the contrary, there have been various studies that advocated nasal packing is not necessary and transseptal suturing techniques might prevent hematoma, abscess or synechiae formation without any complications [10, 11].

Even in the presence of pain at the removal of the splints, the incisions made for alar base surgery can partly or entirely dehisce. Guyuron et al. reported dehiscence of the alar base incision in one patient during splint removal [5]. We believe that cases of splits in the alar base incision during splint removal after alar base surgery, although not published in the literature, may occur frequently. In our practice, particularly in some rhinoplasty patients who underwent alar base surgery, dehiscence would occur despite the greatest care. To avoid these complications, we have been using modified Doyle silicone splints for over 1 year. Therefore, this study aims to examine the effectiveness of the modifications we made to the Doyle silicone splints with regard to pain, postoperative hematoma and bleeding, nasal stuffiness, and dehiscence of the incisions.

Materials and methods

Our study was a prospective, randomized clinical trial. We began our study after receiving the ethics approval from the local ethics committee. Included in the study, which lasted from April 2016 to March 2017, were 64 patients (24 male and 40 female) undergoing alar base reduction surgery together with open septorhinoplasty. Patients with previous nasal surgery, inferior turbinectomy, or bleeding disorders were excluded from the study. At the end of the surgery, the alar crease incision was closed in two layers using a deep 5–0 Vicryl suture to relieve any tension from the skin edges, which were then approximated with a few interrupted 6–0 Prolene sutures (Fig. 1). Postoperatively, a bilateral intranasal Doyle silicone splint was applied on all patients. The service nurse assigned the patients randomly into two groups. Group 1 ($n = 32$) patients received a conventional Doyle intranasal silicone splint after surgery. For group 2 ($n = 32$), we used a modified splint that we call a hemi-split Doyle splint (a variation of the Doyle splint that is longitudinally cut into two halves, preserving a 0.5 cm connection in the front) (Fig. 2). For the patients

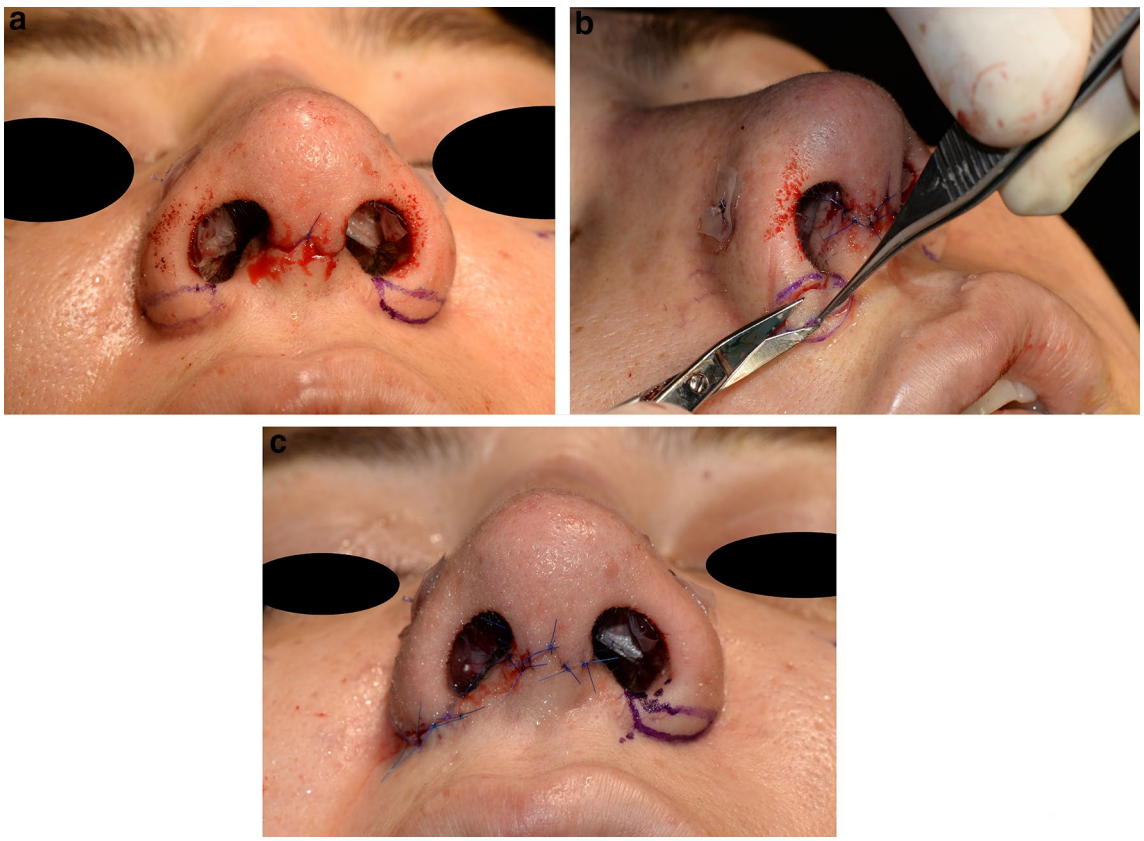

Fig. 1 Intraoperative photographs for alar base reduction. **a** Marking the amount of nasal sill and skin that needs to be excised. **b** Removing the marked area. **c** Closing the alar base incision

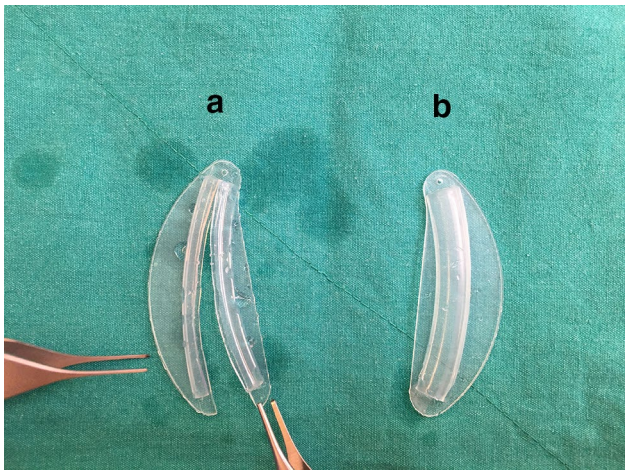

Fig. 2 **a** Hemi-split Doyle splint. **b** Conventional Doyle silicone splint

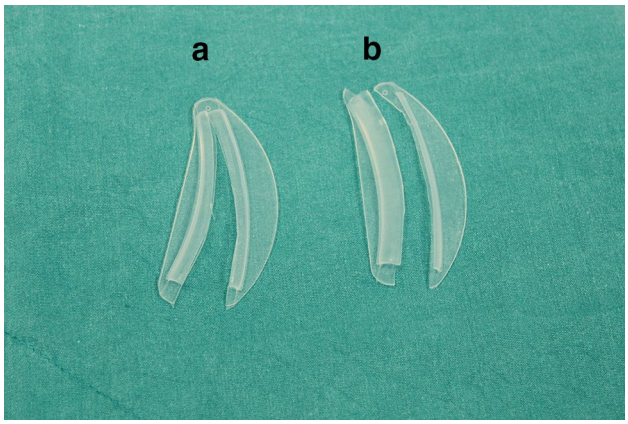

Fig. 3 **a** Hemi-split Doyle splint. **b** After cutting the intact front part of hemi-split Doyle

in both groups, bilateral intranasal splints were fixed at the front with a non-absorbable transseptal suture. The patients did not receive an additional tampon. Postoperatively, all patients received oral antibiotics (amoxicillin and clavulanic acid 1 g twice per day), an antibiotic cream to apply on the incision lines, a pain killer (paracetamol 500 mg twice per day), and a nasal rinse kit (three times per day) to clean the nose.

The splints were removed on day four postoperatively. For group 1 patients, the transseptal suture was removed to free the bilateral Doyle splints, which were then removed by pulling them out of the nasal cavity. For group 2 patients, the transseptal suture was also removed, and the intact 0.5 cm front part of the hemi-split Doyle splint was cut longitudinally entirely into two halves while still inside the nasal cavity (Fig. 3). Subsequently, the two halves of the hemi-split Doyle splint were pulled out of the nasal cavity one by one (Fig. 4). The pain felt by the patients during the removal of the splints was recorded according to the visual analogue scale (VAS) from 0 = no pain to 10 = most severe pain. In addition, on days two and four postoperatively (immediately before splints removal), the nasal stuffiness score (NOSE) was recorded. Nasal obstruction as the questionnaire was introduced in 2004 [12]. The NOSE scale is scaled from 0 to 100, with higher scores meaning more severe nasal obstruction. Moreover, on day four postoperatively, immediately after the removal of the tampons, an intranasal examination was conducted to establish if dehiscence had occurred on the alar base incision line. Prolene sutures were removed on day seven postoperatively.

All surgical interventions were conducted by the same surgeon, and the splints removal, intranasal examination, and data collection were carried out by an otolaryngologist.

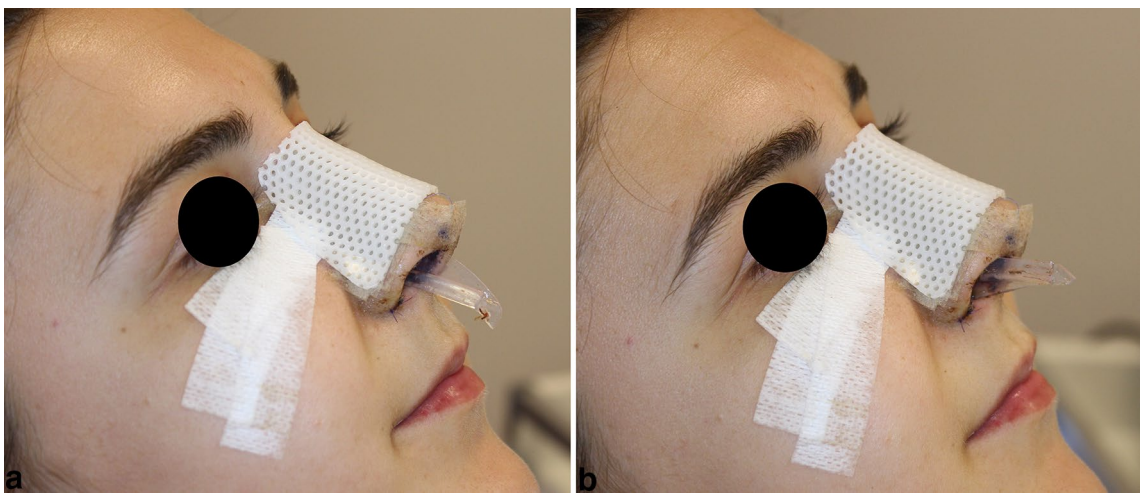

Fig. 4 **a** Removing upper part of hemi-split Doyle. **b** Removing lower part of hemi-split Doyle

Statistical analysis

Statistical analysis was conducted using SPSS v. 22.0 (SPSS Inc., Chicago, IL, USA). All quantitative variables were estimated using measures of central location (i.e., mean and median) and measures of dispersion (i.e., standard deviation).

Independent *t* test was used in the between-group evaluation of quantitative data (pain and nasal stuffiness scores). A $p < 0.05$ was considered statistically significant.

Chi-square test was used for the comparison of qualitative data (hematoma and dehiscence). A $p < 0.05$ was considered statistically significant.

Results

The patients' mean age was 24.6 ± 4.4 years (range 18–39). No significant difference was found in age and sex between the two groups ($p > 0.05$).

In group 2, the pain scores during splints removal were significantly lower than those in group 1 ($p < 0.001$). Whereas no dehiscence on the alar base incision line was observed after splint removal in group 2, the incision dehisced in eight patients in group 1 ($p = 0.002$) (Table 1). The dehisced incision line was resutured after the infiltration of a local anesthetic.

Nasal examination immediately after splints removal found no cases of hematoma, synechia, perforation, or active infection in any of the patients.

The NOSE scores on postoperative days two and four showed no difference between the groups (63.7 ± 6.3 vs. 66.7 ± 6.5; $p2 > 0.05$; 80.9 ± 7.1 vs. 77.8 ± 6.4; $p4 > 0.05$) (Table 1).

Discussion

Rhinoplasty has been frequently performed by facial plastic surgeons in the past several years. Together with rhinoplasty, alar base surgery has been conducted with increasing frequency. One study reported that alar base surgery was performed in 18% of rhinoplasty cases [1].

Table 1 Comparison of pain scores, dehiscence, and nasal stuffiness scores between the groups

	Group 1	Group 2	*p* values
Pain scores	2.9 ± 0.7	1.8 ± 0.7	<0.001[a]
Dehiscence	8 Patients	0	0.002[b]
Nasal stuffiness scores			
On day 2	63.7 ± 6.3	66.7 ± 6.5	0.07[c]
On day 4	80.9 ± 7.1	77.8 ± 6.4	0.08[c]

[a] $p < 0.05$; significance level obtained between groups, Independent *t* test

[b] $p < 0.05$; significance level obtained between groups, Chi-square test

[c] $p > 0.05$; significance level obtained between groups, Independent *t* test

The use of nasal packing or splinting after rhinoplasty is still under debate. Although numerous methods for nasal packing or splinting are available, some authors advocate transseptal suturing techniques as an alternative. Gunaydın et al. suggested that transseptal suturing is not only a safe but also a comfortable and cost-effective technique, compared to nasal packing [10]. Also transseptal suture technique was found to be similarly successful and causes less pain and discomfort for the patient, when compared with nasal packing materials after septoplasty [11]. For approaches using nasal packing, many publications have discussed which type of nasal packing to choose along with their various advantages and disadvantages [3, 13, 14]. Throughout the years, various materials have been used for nasal splinting. Salinger et al. used X-ray films for nasal splinting [15], and Doyle et al. first introduced silicone splints for internal airways [16]. Splint types made of Teflon and polyethylene have also been developed [13].

In addition to providing support, intranasal splints minimize postoperative septal deviation and synechia formation and reduce the risk of hematomas, bleeding, and infection [5]. Therefore, like many other surgeons, we also routinely used splints postoperatively. An ideal splint should not only provide support and prevent complications but also not cause postoperative discomfort; it should be easy to use and remove [17]. Kayahan et al. found that the Doyle nasal splint is more comfortable than the gauze in glove finger. It provides less intranasal edema and it does not cause any nasal blockage or problems of respiration or sleep disturbances [11]. We also used Doyle nasal splints in all our patients. However, patients about to undergo nasal surgery are still mostly concerned about the removal of the splints [18]. Doyle et al. suggested the use of a local anesthetic spray and neo-synephrine when removing the splints. In the same study, they reported that for patients with a small vestibule, the cephalic corner of the splint could be trimmed before insertion [16]. Guyuron and Vaughan also proposed trimming of the rims of the splint for easier insertion, but they reported that easy removal was not always achievable because of variable nostril size. In the same study, they presented one case in which during splint removal, the alar base incision partly dehisced even if the rims of the splint had been trimmed [5]. For these reasons, we felt the need to modify the conventional Doyle nasal splint.

As pointed out above, patients consider the removal of splints after nasal surgery a painful and stressful step. Acıoğlu et al. reported that the Doyle splint, compared with the Merocel tampon, causes less pain during removal [14]. As pain scoring, which is subjective, involves a number of problems, we used the established VAS score for this purpose [3]. Using our proposed modified hemi-split

Doyle splint, the pain scores during removal were significantly lower in patients with the hemi-split Doyle than in those who used the conventional Doyle splints.

An issue of particular concern among alar base surgery patients is the possible dehiscence of incisions during splint removal. As a potential preventive measure, the application of a subcutaneous Vicryl suture after alar base excision was suggested [1]. We also used subcutaneous suturing in all our patients to reduce tension in the incision. As another way to avoid these complications, the use of the Merocel tampon can be considered as an option. However, the Merocel tampon has its disadvantages. First, as the tampon occupies the entire nasal cavity, patients suffer from postoperative nasal stuffiness, second, patients experience intense pain during tampon removal [14]. The hemi-split Doyle may offer a solution for this problem. Whereas eight of our patients who used the conventional Doyle experienced dehiscence of the alar base incision, no case of dehiscence was observed in our patients who used the hemi-split Doyle. Patients with the hemi-split Doyle could breathe postoperatively as easily as those with a Doyle splint but felt less pain during splint removal. Thus, our modified hemi-split Doyle splint could be used particularly in alar base surgery.

On the issue of whether the effectiveness of the silicone splint was compromised because of the modification we made, the hemi-split Doyle showed the same effectiveness as the typical conventional Doyle splint while inside the nasal cavity. The patients tolerated it well as long as nose cleaning was done adequately. Actually, in the NOSE scores on days two and four, we found no difference between the groups, and not a single patient developed complications, such as hematoma, bleeding, infection, synechia, or perforation.

Conclusion

The conventional Doyle silicone splint can cause pain during removal and lead to the splitting of incisions made during alar base surgery. The hemi-split Doyle splint that we modified achieves an equally good nasal opening postoperatively as the Doyle splint, but it causes less pain during removal and particularly does not lead to dehiscence of incisions made during alar base surgery in rhinoplasty patients. The hemi-split Doyle splint can readily be used as an alternative to the conventional Doyle splint, particularly by patients undergoing alar base reduction.

Compliance with ethical standards

Conflict of interest The authors declared no potential conflicts of interest with respect to the research, authorship, and publication of this article.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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