Intranasal splint removal after septal surgery: optimum timing

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Introduction
Insertion of intranasal splints (INSs) after septal surgery with or without turbinate surgery can cause significant pain and discomfort. To date, there is no evidence on the accepted optimal time for INS removal.

Aim
This study aimed to investigate the optimal time for INS removal in patients undergoing septal surgery.

Patients and methods
A prospective randomized clinical study was carried out in Benha University Hospital from April 2018 to February 2019. It included 60 patients who underwent septoplasty with or without turbinoplasty. All patients had been splinted by a silicone nasal splint bilaterally. Patients were allocated into three groups (A, B, and C) according to the time of splint removal (3, 5, and 7 days, respectively). The three groups were compared on bleeding, pain, infection, septal hematoma, septal perforation, crustation, and adhesions.

Results
The median pain score was significantly higher in group C than group A (P=0.031). The median pain score was significantly higher in group C than group B (P=0.045). Adhesions showed a statistically insignificant difference between the three groups (P=0.766). Crustations showed a statistical insignificant difference between the three groups (P=0.863). Bleeding showed a statistically insignificant difference between the three groups (P=0.863). Infection showed a statistically insignificant difference between the three groups (P=0.766). No septal perforation or hematoma was recorded.

Conclusion
Early removal of INSs significantly affects patient comfort and decreases pain. However, the incidence of other postoperative complications increased with short splint duration, but this was statistically insignificant. Therefore, we recommend INS removal after 5 days as an optimal removal time.

Keywords:
splint removal; optimum timing; septoplasty, pain, bleeding, infection

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Introduction

Septoplasty is a common operation performed in Otorhinolaryngology. This operation can be carried out alone or in combination with inferior turbinoplasty, endoscopic sinus surgery, and rhinoplasty [1]. Otorhinologists used an intranasal splint (INS) for septal support and to avoid postoperative complications [2]. These complications include adhesion, crustations, and residual deviation after septal surgery [3]. Different types of splinting materials are reported in the literature such as silicon rubber splints, Teflon, radiograph film splints, and polythene splints. Splints were even made from empty intravenous fluid bottles and plastic milk bottles [4]. Recently, silicone splints have become preferable in septum surgery compared with the other materials as they have the advantage of being safely and comfortably retained intranasally longer than other materials. This splint can be retained intranasally for long durations of up to 10 days in some cases [5]. The possibility of leaving the splints intranasally for extended periods helps stabilize the septum in the midline. However, there is nothing in the literature about how long these splints can be retained inside the nasal cavity without increasing the risk of infection, postoperative complications, and patient discomfort [5].

The timing of INS removal after surgery is still controversial and there is nothing in the literature about how long these splints can be retained inside the nasal cavity without increasing the risk of postoperative complications [5].

Aim

This study aimed to investigate the optimal time for INS removal in patients undergoing septal surgery.

Patients and methods

This was a randomized prospective clinical study of 60 patients attending the Benha University Hospital outpatient clinic who are candidates for septoplasty with or without turbinoplasty in the period from April 2018 to February 2019. For all patients, the surgical indication was nasal obstruction.

Inclusion criteria

(1) Patients with nasal obstruction due to septal deviation (all types of deviation) with or without a hypertrophied inferior turbinate.
(2) Patients aged between 18 and 40 years.

Exclusion criteria

(1) Patients with a previous history of nasal surgery.
(2) Patients with other intranasal pathologies such as nasal polyp or sinusitis.
(3) Patients in whom there was intraoperative septal perforation.
(4) Patients with poor general condition.
(5) Patients with systemic diseases including diabetes mellitus, renal, hepatic and cardiac diseases, and hypertension.

All operative and nonoperative procedures were explained in full detail to the patients, who provided an informed consent and agreed to participate in the study. Also, approval from the ethical committee of ENT Department, Benha University, was obtained.

Patients were randomly allocated into three groups using the closed envelop method.

Operative procedures

The surgical procedures were performed under general anesthesia. All operations were performed by the same surgeon.

Local hemostasis was achieved by injecting 2 ml of xylocaine and epinephrine 1: 200 000 into the caudal septum in the submucoperichondrial plane. A hemitransfixion incision was performed, the mucoperichondrial flap was elevated, septal incision, elevation of the mucoperichondrial flap was performed on the other side and, if needed, the mucoperiosteum was also elevated according to the location of pathology. After the correction of the bony and cartilage deviation, the hemitransfixion incision was sutured with 3-0 absorbable vicryl sutures [3].

Silicone INSs were inserted into both nasal cavities and fixed by 3-0 absorbable vicryl sutures (Fig. 1).

Inferior turbinoplasty was performed using the partial turbinectomy technique, which involves removal of the posterior portion of the inferior turbinate by direct visualization or with the aid of an endoscope. At the end of the operation, the nose was packed with antimicrobial wet dressing gauze in all cases.

Postoperative assessment

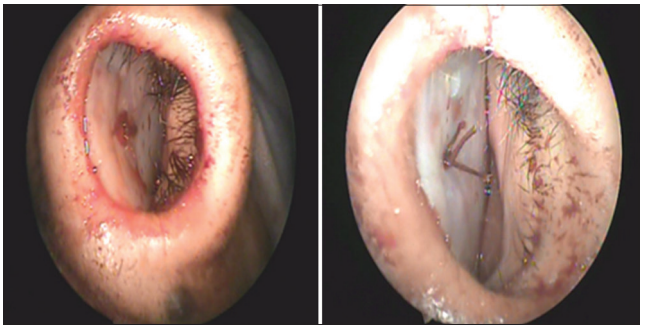
The nasal pack was removed after 48 h. The patients of all groups were administered prophylactic systemic antibiotics (amoxicillin clavulanic acid) for 5 days after the operation and an alkaline nasal wash for nasal douche at home three to four times daily. Patients were discharged from the hospital and followed up in the outpatient clinic for 4 weeks. The patients were randomly distributed into three groups (A, B, and C) according to the splint removal time. Group A included patients whose nasal splints were removed 3 days after surgery, group B included patients whose splints were removed 5 days after the surgery and group C included patients whose splints were removed 7 days after the surgery. Postoperative pain during removal of the splint was evaluated using the visual analog scale (Fig. 2). Any bleeding, infection, septal hematoma, septal perforation, crustation, and synechia formation after splint removal were recorded.

The postoperative visits were at the time of splint removal, the tenth postoperative day, and the fourth postoperative week. Endoscopic examination was performed to compare the rate of postoperative complications.

Data management and statistical analysis were carried out using SPSS version 25. Fisher's exact test was used between groups. A within-group analysis was carried out using Cochran's *Q* test. No pairwise analysis was carried out due to nonsignificant comparisons.

The Mann–Whitney *U* test was used for comparisons between groups. Within-group comparisons were

Figure 1



Postoperative silicone nasal splint fixation.

performed using Friedman's test. *P*1=overall comparison between three groups, *P*2=comparisons between group A and group B, *P*3=comparison between group A and group C, *P*4=comparison between group B and group C, *P*5=overall comparison between 3 days, 10 days, and 4 weeks within each group, *P*6=comparison between 3 and 10 days, *P*7=comparison between 3 days and 4 weeks, and *P*8=comparison between 10 days and 4 weeks. All pairwise comparisons were Bonferroni adjusted.

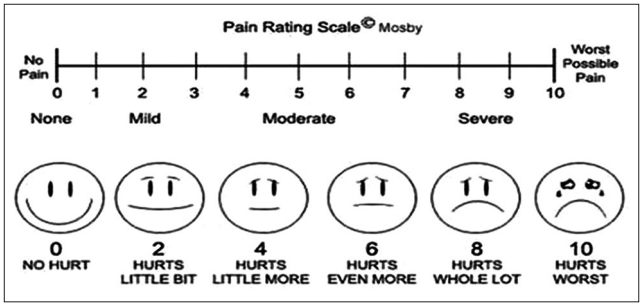
Results

A total of 60 [35 (58.33%) males and 25 (41.66%) females] patients were included in this study, age range from 18 to 40 years and a mean follow-up period of 4 weeks (range: 2–6 weeks) (Table 1).

These patients were divided into three groups according to the splint removal time. In the first group A, INSs were removed 3 days after surgery, in the second group B, splints were removed 5 days after the surgery and in the third group C, splints were removed 7 days after the surgery. Each group included 20 patients.

In terms of the type of procedures performed in all groups, 29 (48.33%) patients underwent septoplasty and 31 (51.66%) patients underwent septoplasty with inferior turbinoplasty.

Figure 2



Visual linear analog scale (0–10 numeric pain distress scale) [6].

In terms of the type of procedures performed in group A, 12 (60%) patients underwent septoplasty and eight (40%) patients underwent septoplasty with turbinoplasty, in group B, 11 (55%) patients underwent septoplasty and nine (45%) patients underwent septoplasty with turbinoplasty and in group C, 10 (50%) patients underwent septoplasty and 10 (50%) patients underwent septoplasty with turbinoplasty.

In terms of type of surgery, pairwise analysis revealed that the median pain score was significantly higher in group C than group A (*P*=0.031). The median pain score was significantly higher in group C than group B (*P*=0.045). There was no significant difference in the pain score between group A and group B (*P*=1.0). At the 10-day follow-up, the pain score was significantly higher in group C (three) than group A (two), *P* value of 0.039. However, there were no significant differences in the pain score between group A and group B and group B and group C. *P* values were 0.533 and 0.766, respectively (Table 2 and Fig. 3).

Complications (in terms of type of operation)

Group A

Adhesions were noticed in two (10%) patients (who had undergone septoplasty with turbinoplasty) 4 weeks after surgery. We cut the adhesion under local anesthesia by changing light Vaseline packs daily for a week.

Three (15%) patients (who had undergone septoplasty with turbinoplasty) had significant bleeding on splint removal that required anterior nasal repacking for 12–24 h.

The rest of the cases in the group showed no bleeding, minor self-limited oozing, or minor bleeding controlled by one to three ephedrine packs.

Infections occurred in three (15%) patients (two at the time of splint removal and one at 10 days after surgery), diagnosed by congested nasal mucosa

Table 1 Pain scores in different study groups at different follow-up times

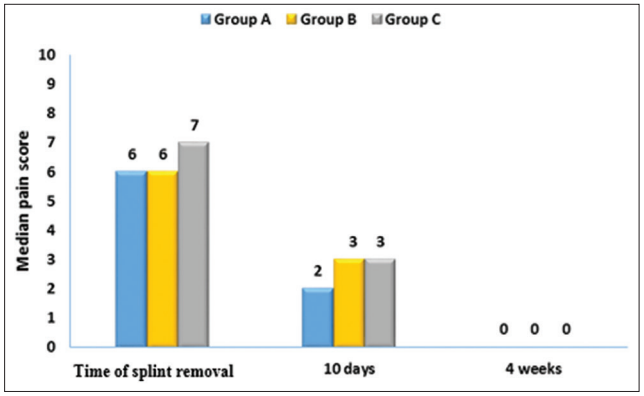
	Group A (*n*=20)		Group B (*n*=20)		Group C (*n*=20)		*P*1	*P*2	*P*3	*P*4
	Median	Range	Median	Range	Median	Range				
Pain at the time of splint removal	6	3-8	6	3-8	7	4-9	0.016*	1.0	0.031*	0.045*
Pain at 10 days	2	0-4	3	0-5	3	1-4	0.045*	0.533	0.039*	0.766
Pain at 4 weeks	0	0-1	0	0-3	0	0-2	0.316	-	-	-
*P*5	<0.001*		<0.001*		<0.001*					
*P*6	0.004*		0.003*		0.005*					
*P*7	<0.001*		<0.001*		<0.001*					
*P*8	0.008*		0.013*		0.005*					

*mean it is significant result as P values less than 0.05 were considered significant

Table 2 Frequency distribution of crustations in different study groups at different follow-up times

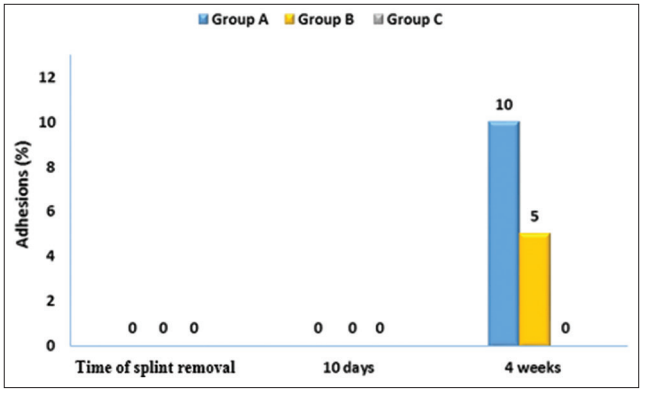
	Group A (*n*=20) [*n* (%)]	Group B (*n*=20) [*n* (%)]	Group C (*n*=20) [*n* (%)]	*P*
Crustation at the time of splint removal	0	0	3 (15.0)	0.1
Crustation at 10 days	2 (10.0)	1 (5.0)	3 (15.0)	0.863
Crustation at 4 weeks	0	0	0	-
P	0.135	0.368	0.05	

Figure 3



Pain score in different study groups at different follow-up times.

Figure 4



Frequency of adhesions in different study groups at different follow-up times.

with mucopurulent discharge. It was managed by local and systemic decongestant and systemic antibiotics (amoxicillin clavulanic acid) for 5 days.

Group B

Single unilateral adhesion was noticed in only one (5%) patient in group A (who had undergone septoplasty with turbinoplasty) by the fourth week after surgery. It was managed as mentioned before.

Two (10%) patients (who had undergone septoplasy with turbinoplasty) had significant bleeding on splint removal that required anterior nasal repacking for 12–24 h.

Only one (5%) case of infection occurred at the time of splint removal, which was diagnosed and managed as before.

Group C

In group C, no bleedings, adhesions, or infection were observed.

No septal hematoma or septal perforation was reported in any of the study groups at different follow-up periods.

None of the groups showed significant differences in the incidence of complications (Tables 3-6 and Figs. 4-7).

Discussion

INSs are widely used after nasal septal surgery for prevention of intranasal adhesions and support of the septal position [7]. There are different opinions about the optimal time of removal of INSs [8]. There are various opinions in the literature about pain scores and other complications after the use of nasal splints.

In this study, pain was significantly more in group C (7-day splint) than in group A (3-day splint) and group B (5-day splint). Also, pain was more significant in patients who underwent septoplasty with turbinate surgery than in patients who underwent septoplasty alone.

This result is in agreement with Aksoy *et al.* [1], who reported that with the removal of INSs within 24 h after surgery, the discomfort and the pain would be less with no effect on the postoperative complication rates.

Another studies refused long splint period include; Campbell *et al.* [9] reported that the splints significantly increased the pain and discomfort from the nasal operations in the early postoperative period. Pain scores were higher in the patients with nasal splints compared with the patients without splints. Also, another study by Malki *et al.* [10] reported that 1 week postoperatively, the patients with splints experienced significantly more pain and discomfort than the group without splints.

However, these results were not in agreement with Ozdogan *et al.* [8], who reported that there was no significant difference in nasal fullness and pain on the third, fifth, and seventh days.

Our study results showed that adhesions occurred in group A and group B, but did not occur in group C,

Table 3 Frequency distribution of infection in different study groups at different follow-up times

	Group A (*n*=20) [*n* (%)]	Group B (*n*=20) [*n* (%)]	Group C (*n*=20) [*n* (%)]	*P*
Infection at the time of splint removal	2 (10.0)	1 (5.0)	0	0.766
Infection at 10 days	1 (5.0)	0	0	1
Infection at 4 weeks	0	0	0	-
P	0.223	0.368	-	

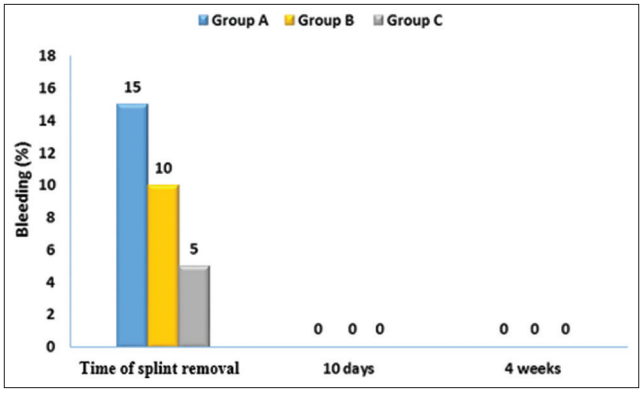
Table 4 Frequency distribution of adhesions in different study groups at different follow-up times

	Group A (*n*=20) [*n* (%)]	Group B (*n*=20) [*n* (%)]	Group C (*n*=20) [*n* (%)]	*P*
Adhesions at the time of splint removal	0	0	0	-
Adhesions at 10 days	0	0	0	-
Adhesions at 4 weeks	2 (10.0)	1 (5.0)	0	0.766
P	0.135	0.368	-	

Table 5 Frequency distribution of bleeding in different study groups at different follow-up times

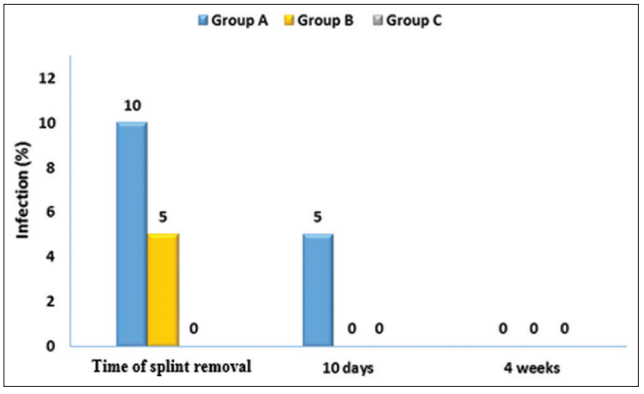
	Group A (*n*=20) [*n* (%)]	Group B (*n*=20) [*n* (%)]	Group C (*n*=20) [*n* (%)]	*P*
Bleeding at the time of splint removal	3 (15.0)	2 (10.0)	1 (5.0)	0.863
Bleeding at 10 days	0	0	0	-
Bleeding at 4 weeks	0	0	0	-
P	0.05	0.135	0.368	

Figure 5



Frequency of bleeding in different study groups at different follow-up times.

Figure 6



Frequency of infection in different study groups at different follow-up times.

with no significant effect of time of splint removal on the incidence of adhesions. Adhesions mainly occurred in patients who underwent combined septoplasty and partial inferior turbinectomy due to the presence of two raw surfaces opposite each other, but did not occur in patients who underwent septoplasty alone.

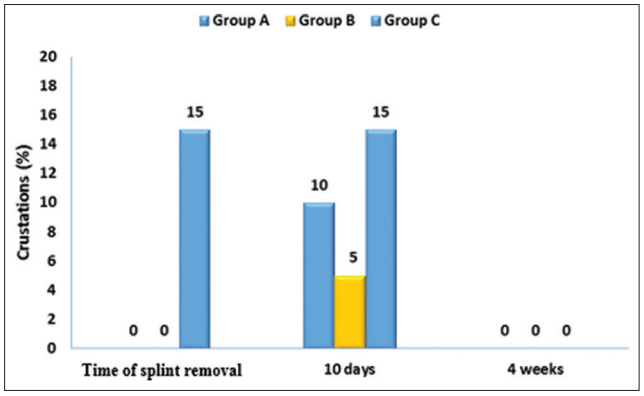
These results are in agreement with Ozdogan *et al.* [8], who reported that nasal synechia was detected in two patients in the first group (3-day splint) and in one patient in the second group (5-day splint) at the eighth week, but was not detected in the third group; however, the percentage of adhesion formation was insignificant between the three groups. Also, Aksoy *et al.* [1] reported that there is no significant difference in the percent of adhesion formation between the removal of INSs in 24 h and after 5 days of operation.

However, these results were not in agreement with Malki *et al.* [10], who reported that nasal splints are not effective in the prevention of nasal adhesions and finally adhesions will occur in splinted and unsplinted patients as they compared splinted with unsplinted sides, while in our study, we used splints on both sides.

Bleeding was minimal; only a few patients had massive bleeding in group A and group B at the time of splint removal, which was controlled by anterior nasal packing for 12–24 h, with no significant difference. Bleeding occurred especially in patients who underwent septoplasty with inferior turbinoplasty.

This also was reported by Ozdogan *et al.* [8], who found that early-period hemorrhage was detected in two patients in the first group (3-day splint) and in one patient in the third group (7-day splint), but was not detected in

Figure 7



Frequency of crustations in different study groups at different follow-up times.

the second group (5-day splint). However, there was no significant difference between the three groups.

Nasal crustation is common after any kind of nasal surgery. However, nasal crusting is not mentioned much in the literature as a complication of nasal surgery as it usually resolves and is easily managed by continuous irrigation and nasal wash. In our study, the incidence of crustations was insignificantly higher in group C (7-day splint) mainly with turbinate surgery.

Our study showed that infection was insignificant. Infection occurred in the first and second groups, but did not occur in the third group. Only minor infections in the form of vestibulitis and infection of incision site occurred, but no major infection was recorded.

This result is in agreement with Ozdogan *et al.* [8], who reported that the incidence of infection in the three groups in which splints were removed after 3, 5, and 7 days was statistically insignificant.

No septal hematoma or septal perforation was recorded in our study. This result was not in agreement with Ozdogan *et al.* [8], who reported that septal hematoma was detected in one patient in the first group and was not detected in the other groups. Also, septal perforation was detected in one patient in the first group at the 24th week and was not detected in the other groups as more patients were included in this study than in our study.

Conclusions and recommendations

Use of INSs after septal operations is considered to be helpful in preventing adhesions. However, it is associated with pain and sensation of discomfort. Our study shows that early removal of INSs, group A (after 3 days) and group B (after 5 days), significantly affects the patient's comfort and decreases pain sensation compared to group C. Although the incidences of complications are increased with a short splint duration, this was not statistically significant.

Therefore, we recommend removal of INSs on the fifth day (group B) as an optimal time as it is associated with less discomfort, less pain on splint removal than the seventh day and also the incidence of complications is lower than that with 3-day splinting.

Also, we recommend more studies comparing 5-day splinting with less duration and with no splinting. In addition, we recommend these studies on larger scales and with longer periods of follow-up. In addition, we recommend comparison of different splint materials.

Table 6 Demographic characteristics in different study groups

	Group A (*n*=20)	Group B (*n*=20)	Group C (*n*=20)	*P*
Age (years)				
Mean±SD	27±7	27±7	26±5	0.88
Sex [*n* (%)]				
Males	11 (55.0)	12 (60.0)	12 (60.0)	0.934
Females	9 (45.0)	8 (40.0)	8 (40.0)	

The Mann-Whitney *U* test was used for age and the χ^2 test was used for sex.

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Nil.

Conflicts of interest
There are no conflicts of interest.

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