

# A new method of construction of obturators for nasal septal perforations and evidence of outcomes

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## Keypoints

- Septal obturators and buttons for nasal septal perforations are often poorly tolerated.
- We describe a new method of obturator construction using three-dimensional imaging which more closely replicates the true anatomy of the defect.
- Patients were assessed using a questionnaire relating to how symptoms had changed between having no obturator, a conventional obturator and the new CT obturator.
- Eight of nine patients had an improvement in total symptom scores comparing old obturators to new CT obturators and this was significant with a *P*-value of 0.018 using Student's paired *t*-test.
- The majority of patients were satisfied with the new obturators and reported an overall improvement of symptoms.

Most patients with nasal septal perforations are totally free from symptoms<sup>1</sup> and can be managed conservatively with nasal douching, emollients or humidification. However, large symptomatic perforations remain a challenge. Many techniques have been described to achieve surgical closure but no technique has been proved as more successful in any large trial.<sup>2</sup> An unsuccessful operation is also costly, has risks and can cause the perforation to increase in size. Some authors have advocated primarily closing all troublesome perforations with obturators,<sup>1</sup> reserving surgery for those in whom this fails.

Septal obturators have been used in many guises, constructed either from silastic<sup>®</sup> silicone rubber or acrylic resin. The prefabricated non-custom-made septal buttons are often uncomfortable due to their imprecise fit,<sup>3</sup> especially with irregular and large perforations. Septal obturators can be made by taking dental impressions of the perforation but these can be difficult to perform accurately. On occasions, a general anaesthetic is needed to take an impression of the perforation, adding higher costs and a potential risk to the patient.

We present a follow-up study of cases of nasal septal perforations treated with silastic<sup>®</sup> obturators created to fit exactly into the perforation with the aid of computed tomography (CT) scanning.

## Materials and methods

### Patients

The study was based at The Queen Elizabeth Hospital (Birmingham, UK). Over a period of 18 months, details of patients in whom conservative measures had failed and hence underwent this process of obturator construction were kept in a log book. A questionnaire was created and each patient was telephoned to obtain opinions regarding their symptoms.

### Technique of obturator construction

Our technique utilises a three-dimensional CT scan with 1-mm slices of the septum. Specialised MIMICS software (Materialise, Leuven, Belgium) is then used to select the septum for modelling. The model is built in 0.1-mm layers and further software is used to interpolate intermediate slices between the scan data slices. The model is then made by curing a photopolymer liquid resin to solid using an ultraviolet laser. Layers are added in 1-mm sections until the required model is complete. On return to the dental prosthetics specialists, a wax pattern of the obturator is made and this is invested into a mould.

The wax is then lost and silicone is used to pack the defect that is left. The silicone is cured creating the accurately shaped obturator. It is then inserted into the patient's perforation in an outpatients setting with the aid of local anaesthetic spray (Fig. 1).

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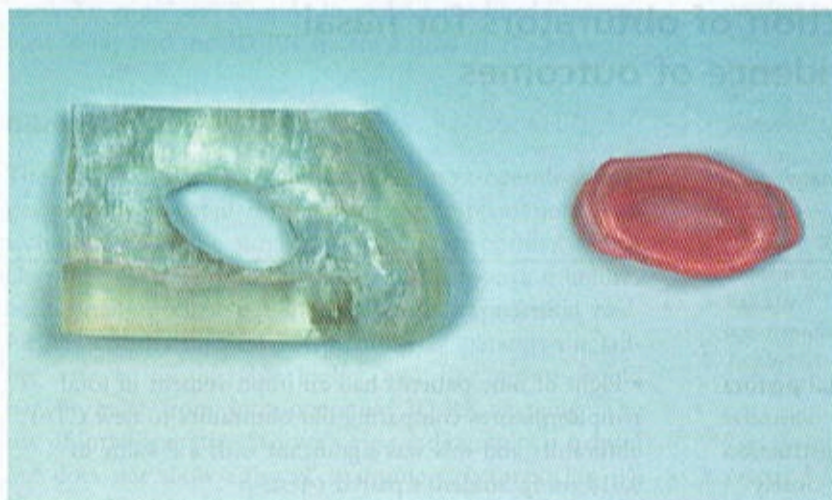


Fig. 1. Silicone model of a patient's nasal septal perforation and the resulting obturator which accurately fitted the defect.

### Questionnaire

The Nasal Septum Obturator Questionnaire detailed the causes of perforation, the dates of previous obturator insertion and new CT obturator insertion. This was based on work by Luff *et al.*<sup>3</sup> who used a similar questionnaire for septal perforation symptoms as this was felt to be the most straightforward but comprehensive in the literature. Questions were asked regarding symptoms without an obturator, with a previous obturator and after insertion of the new CT obturator (Table 1). Symptoms were categorised as either absent, mild, moderate or severe and each of these was graded 0, 1, 2 and 3, respectively, so that comparison for each patient and between patients could be made. Finally, they were asked whether it was helpful in improving symptoms and whether they were satisfied overall.

Table 1. Nasal septum obturator questionnaire

Symptoms	Severity			
	Nil	Mild	Moderate	Severe
Nose blockage				
Crusting				
Bleeding				
Whistling				
Discharge				
Headache				
Facial pain				
Wake up at night				
Wake up tired				
Frustrated/irritable				
Sad				
Embarrassed				

### Results

Thirteen patients had been fitted with the new CT obturators and of these, 10 patients were contactable; five female and five male. The mean age was 47 with a range between 37 and 64. CT obturators had been *in situ* between 4 and 18 months (mean 8.3 months). The causes of the septal perforations are shown in Table 2.

Nine patients had previously had an obturator or button *in situ*. For one patient her first obturator was made using the CT fabrication method. All patients experienced a reduction in symptom scores (see Table 3) both with conventional obturators and the new CT obturators compared with no obturator. Student's paired *t*-test was used to assess as to whether there was a significant difference in scores between the groups. The difference of the scores for conventional obturators compared with no obturator was significant with a *P*-value of 0.001 (95% CI for the mean of 10.77–17.45) and was also significant for the new CT obturators with a *P*-value < 0.001 (CI: 8.188–14.21). Symptom scores of patients with new CT obturators were reduced in eight of nine patients who had previously experienced an obturator *in situ*. The *P*-value comparing the reduction in these two groups of scores

Table 2. Causes of septal perforation

Cause of perforation	n (%)
Self-induced	2 (20)
Postsubmucous dissection	2 (20)
Hypophysectomy with a sublabial incision	1 (10)
Industrial (factory acid)	1 (10)
Industrial (unknown origin)	1 (10)
Prolonged nasal spray use	1 (10)
Spontaneous	2 (20)

**Table 3.** Symptom scores for each group

Patient	Pre-insertion score (group A)	Pre-CT obturator insertion score (group B)	Post-CT obturator insertion score (group C)
1	5	-	0
2	16	6	2
3	12	7	3
4	10	5	2
5	12	0	0
6	21	9	4
7	12	11	3
8	17	1	3
9	19	5	2
10	8	2	1

was 0.018 (CI: 0.633–5.145) and so also showing a significant difference in total scores.

On asking whether the CT obturator improved symptoms overall, six patients agreed, three stated that it made no difference and one patient said it was worse. Eight patients stated that they were pleased overall with the new obturator.

## Discussion

The symptoms caused by nasal septal perforations can cause a great deal of distress. In our study virtually all patients complained of epistaxis, crusting, whistling and obstruction. This is mirrored in other studies.<sup>3,4</sup> Brain<sup>1</sup> suggests the use of obturators as first-line treatment, reserving surgical closure for patients in whom this is unsuccessful.

### Surgical closure

Most surgical techniques focus on closing the perforation rather than solely improving symptoms. A number of methods have been evaluated<sup>2</sup> and their description is beyond the scope of this article, but no method has proved to give superior results for sustained closure and overall patient satisfaction. Our method of perforation closure has the major advantages of no inpatient stays, no potential complications and patients do not have to visit specialist centres for their treatment.

### Mechanical closure

Mechanical closure can be achieved with prefabricated buttons or personalised obturators using a number of different techniques including using paper as a template to draw the perforation, using mould material on a cotton

swab or injecting vinyl polysiloxane to make an impression.<sup>5</sup> These methods are unlikely to be as accurate as CT-scanned images for obturator production and have the disadvantage of being uncomfortable for the patient. They also do not take the surrounding structures into consideration for creation of the flanges. Prefabricated septal buttons were used by Luff *et al.*<sup>3</sup> who found that patients tolerated septal buttons poorly. Nine of 14 of their patients had a decreased symptom score whereas we found that the symptom score was decreased in nine of our 10 patients. This suggests that the more precise fit of the CT obturator leads to better tolerance.

A group of 23 symptomatic patients were given prefabricated silastic<sup>®</sup> silicone septal buttons by Osma *et al.*<sup>5</sup> The button was reshaped after a tracing of the perforation was made using paper and pen. In a follow-up period of 15 months, all symptoms had improved except for crusting which was noted in four patients who had not experienced this previously. In our study, crusting was reduced in all the patients with the CT obturator.

A study by Price *et al.*<sup>4</sup> also described the use of CT images for constructing custom nasal septal obturators. They hand carved a block of silicone after tracing the CT image using a pencil and paper. Our method utilises a laser which models the resin model using information directly from the computerised three-dimensional image. Their custom-made septal buttons provided a more comfortable fit, better symptomatic relief and less button loss. This was only compared with the situation when no obturator was *in situ*. They did not look at whether their CT obturators were superior to prefabricated buttons with regard to patients' symptoms. Our method of obturator construction has been shown to reduce the symptoms of patients who had previously used obturators.

The cost of the scanning and construction is around £200–£250. The technology does not exist yet for magnetic resonance image scanning to be used and this would be slightly more expensive. It is recognised that we only have experience with a small number of patients. A randomised controlled study is needed to see if this new intervention truly does have advantages over previously available obturators.

### Conflict of Interest

None declared.

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