© Malaysian Journal of Anaesthesiology 2025; 4:126-138
Original article
https://doi.org/10.35119/myja.v4i2.99

Submental intubation in maxillofacial fracture surgery: single-centre experience

Sabrina **Peter**[1], Kumaran **K. Sinniah**[2], **Keong** Jia Yee[1]

[1]*Department of Oral and Maxillofacial Surgery, Hospital Teluk Intan, Perak, Malaysia;*
[2]*Department of Anaesthesiology, Hospital Teluk Intan, Perak, Malaysia*

Abstract

Introduction: Submental intubation provides a valuable alternative in maxillofacial fracture surgery when oral and nasal routes are contraindicated. A key advantage is that it allows for dental occlusion, which is necessary for proper alignment of fractured bone fragments. Despite its benefits, this technique remains underutilised in Malaysia due to limited research, training, and exposure among anaesthesiologists. Therefore, this study aimed to explore the types of maxillofacial fractures as well as the indications and complications of submental intubation.

Methods: This was a retrospective study using the census sampling technique. A total of 11 patients who underwent submental intubation via a paramedian approach with double haemostats at Hospital Teluk Intan between January 2022 and March 2025 were reviewed. Immunocompromised patients were excluded. A descriptive analysis was performed on the types of maxillofacial fractures, indications for submental intubation and postoperative complications.

Results: Data from 11 patients were analysed (median age: 24 years; interquartile range: 17–42 years; 9 males and 2 females; 8 Malays, 1 Chinese and 2 Indians). Seven patients (63.6%) sustained combined midface and mandibular fractures, 3 patients (27.3%) had midface fractures, and 1 patient (9.1%) had mandibular

Correspondence: Keong Jia Yee, Department of Oral and Maxillofacial Surgery, Hospital Teluk Intan, Jalan Changkat Jong, 36000 Teluk Intan, Perak, Malaysia.
E-mail: keongjiayee@moh.gov.my

fracture. Additionally, 7 patients (63.6%) presented with nasal bone and/or septum fractures, 2 patients (18.2%) had skull base fracture, and 2 patients (18.2%) had combined fractures of nasal bone, septum, and skull base. One patient developed a postoperative infection and hypertrophic scar, while the remaining 10 recovered uneventfully. The observed complication rate was 9.1% (95% CI: 0.2%–40.3%).

Conclusion: Submental intubation appears to be a safe and feasible alternative with minimal complications. Larger studies are needed to validate these preliminary findings.

Keywords: airway management, alternative airway techniques, complications, maxillofacial trauma, submental intubation

Introduction

Airway management in patients with complex maxillofacial fractures remains a significant challenge for anaesthesiologists. In Malaysia, submental intubation is not commonly used outside the field of oral and maxillofacial surgery despite its advantages. Nasal intubation is typically the method of choice in maxillofacial surgery because it allows intraoperative maxillomandibular fixation to achieve optimal dental occlusion and proper alignment of fractured facial bone fragments.[1-3] However, in cases with fractures of the naso-orbital ethmoid complex, skull base, or anterior and middle cranial fossae,[4,5] nasal intubation is rendered unsafe and is contraindicated. In such scenarios, submental intubation offers a safe, effective, and practical alternative in intraoperative airway management without compromising surgical access or occlusion.

Submental intubation was first introduced by Altemir in 1986 to allow the passage of an endotracheal tube through the anterior floor of the oral cavity.[1,4] The original procedure begins with oral intubation followed by conversion to the submental route.[1,4] This is achieved by making a 2-cm transverse incision in the submental region, followed by blunt dissection through muscles of the floor of the mouth until the oral mucosa is reached.[4] The pilot balloon and the endotracheal tube are then exteriorised through the soft tissue tunnel using a haemostat.[1,4] After the surgery, the endotracheal tube is reversed to its original oral position.[1] Since its introduction, various modifications have been made to the technique to improve safety and efficiency.

With the development of submental intubation, tracheostomy, which is traditionally the alternative to nasal and oral intubation, can be avoided in cases

not requiring prolonged postoperative ventilation.[1] Tracheostomy is generally undesired and is typically reserved as a last resort due to its specialised postoperative care and the higher risk of both immediate and late complications,[1,2,4,5] including pneumothorax, pneumonia, surgical emphysema, tracheal stenosis, tracheomalacia, recurrent laryngeal nerve palsy, and injury to other structures of the cervical neck.[1,4,5]

In contrast, submental intubation is relatively safe, minimally invasive, simple and time-efficient.[1,4] The literature reports a 100% success rate with the average duration of the procedure being approximately 10 minutes.[6,7] The complication rate is low, ranging from 7% to 9%.[1,7] The most common complication is skin infection, followed by hypertrophic scarring and orocutaneous fistula formation.[1,5,7] Rare complications include injury to adjacent vital structures, such as lingual neurovascular bundle, marginal mandibular branch of facial nerve, sublingual gland, duct of the submandibular gland and formation of mucocele.[1-4] In addition, other rare complications associated with the endotracheal tube include tube dislodgement or kinking, accidental extubation, tube migration into the bronchus, pilot balloon damage, and desaturation.[2]

To date, research on submental intubation within the local context remains limited, particularly in relation to its local incidence, complications, and feasibility. While submental intubation has been studied in other regions, the technique remains underutilised in Malaysia, largely due to a lack of widespread training and exposure among anaesthesiologists. Consequently, many are unfamiliar with the procedure, leading to hesitation in its application.[2] This highlights the need to assess the current practice of submental intubation in Malaysia and evaluate its feasibility, associated complications, and potential for broader implementation. Accordingly, this study aimed to investigate the types of maxillofacial fractures, indications, and complications of using submental intubation in the Department of Oral and Maxillofacial Surgery of Hospital Teluk Intan.

Methods

This was a retrospective study using the census sampling technique. This study was approved by National Medical Research Register (RSCH ID-25-03214-SG7). A total of 11 patients who underwent submental intubation for intraoperative airway management at Hospital Teluk Intan between January 2022 and March 2025 were identified from the operation theatre list. All patients with maxillofacial fractures in which nasal and oral intubation were not feasible were included in this study. Immunocompromised patients with impaired postoperative healing and those

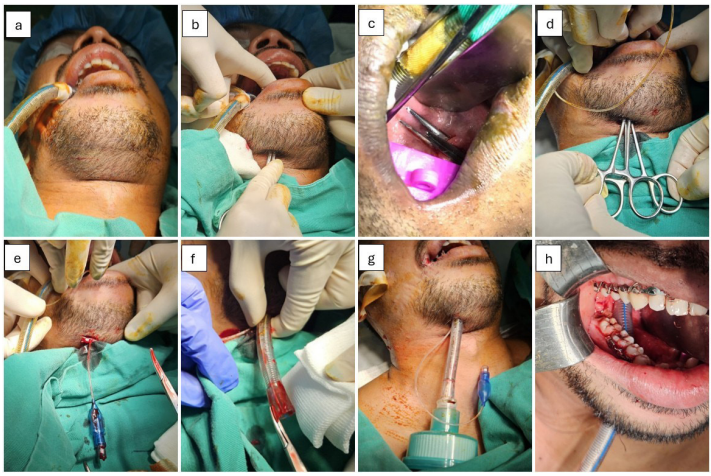

Fig. 1. Submental intubation technique. *(a)* With oral intubation in place, 1.5-cm paramedian incision made at the submental region. *(b)* Blunt dissection made from the incision site through the floor of the mouth. *(c)* Intraoral view showing blunt dissection to the oral mucosa. *(d)* Insertion of double haemostats. *(e)* Exteriorisation of the pilot balloon through the soft tissue tunnel using a haemostat. *(f)* Exteriorisation of the endotracheal tube using another haemostat. *(g)* Extraoral view showing completed submental intubation after conversion from the oral to submental route. *(h)* Intraoral view showing completed submental intubation.

who were not compliant with postoperative instructions were excluded from the study. Sample size calculation was not applicable, as all eligible patients were included in the study.

The same technique of submental intubation was employed for all patients by 2 oral and maxillofacial surgeons. This technique was in accordance with the general principles of the original Altemir technique using a flexometallic endotracheal tube with a modification consisting of a 1.5-cm paramedian incision and exteriorisation of the endotracheal tube and pilot balloon using double haemostats as illustrated in Figure 1.

As routine antibiotic prophylaxis, 1.5 g of intravenous cefuroxime was given 1 hour preoperatively, and the oral dose of 250 mg was continued twice daily postoperatively for 1 week. Oral hygiene was maintained postoperatively using 0.12% chlorhexidine mouthwash 2 to 3 times daily for 1 week. Patients were reviewed postoperatively on day 1, then at 1 week and 1 month to assess any postoperative complications. Surgical site infection was defined as infection that occurred after surgery at the site of submental intubation with purulent drainage, pain, swelling, redness, or heat. A hypertrophic scar was defined as an abnormally thick, raised

and red or dark scar that formed at the site of submental intubation. Inter-rater agreement was not performed as the measurement outcomes were primarily objective.

The clinical record, computed tomography report, and operation note of patients were reviewed and analysed. Data collection form was used to collect the study data on the types of maxillofacial fractures, indications, and complications of submental intubation. Statistical analysis was performed using SPSS 24.0 (IBM Corporation, USA). Descriptive data was presented as number and percentage of patients in respective categories.

Results

Between January 2022 and March 2025, 99 patients in the Department of Oral and Maxillofacial Surgery in Hospital Teluk Intan underwent maxillofacial fracture surgery under general anaesthesia using various intubation techniques. Among these, submental intubation was used in 11 patients (11.1%) as the means of intra-operative airway management. The demographics of patients who underwent submental intubation are presented in Table 1; most patients were male (81.8%) and Malay (72.7%) with the median age of 24 years. The clinical profile of patients who underwent submental intubation are shown in Table 2.

Figure 2 shows the types of maxillofacial fractures that required submental intubation. Combined midface and mandibular fractures were the most common (63.6%), followed by isolated midface (27.3%) and isolated mandibular (9.1%) fractures. Figure 3 highlights the indications for submental intubation: 7 patients (63.6%) underwent submental intubation due to nasal bone and/or septum fractures, 2 (18.2%) due to base of skull fracture, and 2 (18.2%) due to combined fractures of nasal bone, septum, and skull base.

Only 1 patient developed complications, including skin abscess on postoperative day 3 and hypertrophic scar at 2 weeks postoperatively, both of which were managed successfully. The remaining 10 patients had uneventful recoveries (Fig. 4). The observed complication rate was 9.1% (95% CI: 0.2%–40.3%).

Table 2. Clinical profile of patients who underwent submental intubation at Hospital Teluk Intan between January 2022 and March 2025

Case	Gender	Age	Ethnicity	Types of maxillofacial fracture surgery	Indications	Complications
1	Male	42	Chinese	Combined midface and mandible fractures (left zygomaticomaxillary complex, Le Fort 1, bilateral subcondyles and symphysis of mandible)	Nasal bone and septum fractures	None
2	Male	25	Indian	Combined midface and mandible fractures (left zygomaticomaxillary complex, Le Fort 1, bilateral parasymphysis of fracture)	Nasal bone and septum fractures	None
3	Male	36	Malay	Isolated midface fracture (Le Fort 2)	Nasal bone and septum fractures	Skin abscess, hypertrophic scarring
4	Male	17	Malay	Combined midface and mandible fractures (left zygomaticomaxillary complex, left coronoid process of mandible)	Base of skull fracture	None
5	Male	41	Malay	Combined midface and mandible fractures (Le Fort 2, left zygomaticomaxillary complex, right parasymphysis, left ramus of mandible)	Base of skull, nasal bone and septum fractures	None

Case	Gender	Age	Ethnicity	Types of maxillofacial fracture surgery	Indications	Complications
6	Male	24	Indian	Isolated midface fracture (right zygomaticomaxillary complex, Le Fort 2)	Base of skull, nasal bone and septum fractures	None
7	Male	33	Malay	Isolated midface fracture (Le Fort 1, left zygomaticomaxillary complex)	Nasal bone and septum fractures	None
8	Male	22	Malay	Combined midface and mandible fractures (left zygomaticomaxillary complex, left angle of mandible)	Nasal septum fracture	None
9	Male	20	Malay	Combined midface and mandible fractures (Le Fort 1, left zygomaticomaxillary complex, right orbital floor, left parasymphysis, left body of mandible)	Nasal bone fracture	None
10	Female	19	Malay	Combined midface and mandible fractures (right zygomaticomaxillary complex, symphysis of mandible)	Nasal bone fracture	None
11	Female	22	Malay	Isolated mandible fracture (left parasymphysis, right angle of mandible)	Base of skull fracture	None

Table 1. Demographics of patients who underwent submental intubation at Hospital Teluk Intan between January 2022 and March 2025

Demographics	Number of patients (%)
Gender	
Male	9 (81.8)
Female	2 (18.2)
Age	
≤ 18	1 (9.1)
>18 and <60	10 (90.9)
Ethnicity	
Malay	8 (72.7)
Chinese	1 (9.1)
Indian	2 (18.2)

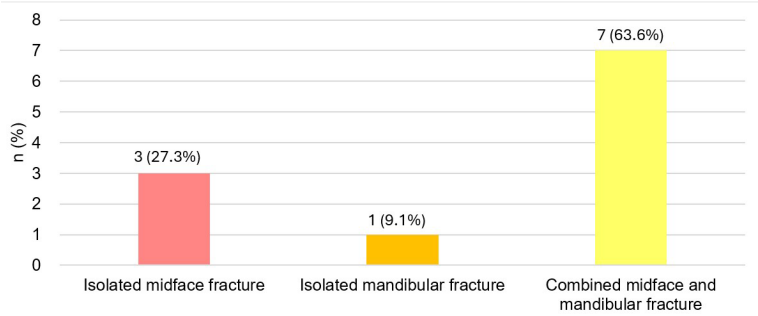

Fig. 2. Types of maxillofacial fractures that underwent submental intubation at Hospital Teluk Intan between January 2022 and March 2025.

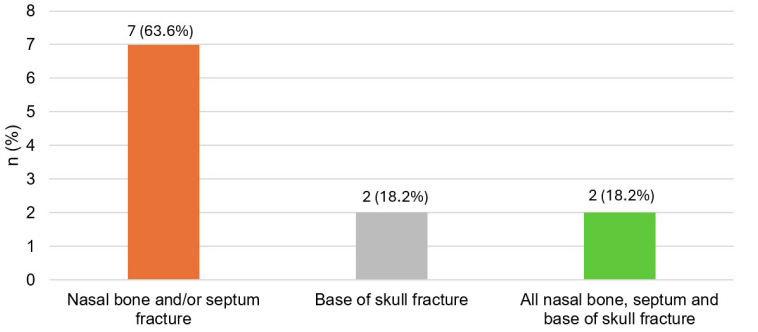

Fig. 3. Indications for submental intubation at Hospital Teluk Intan between January 2022 and March 2025.

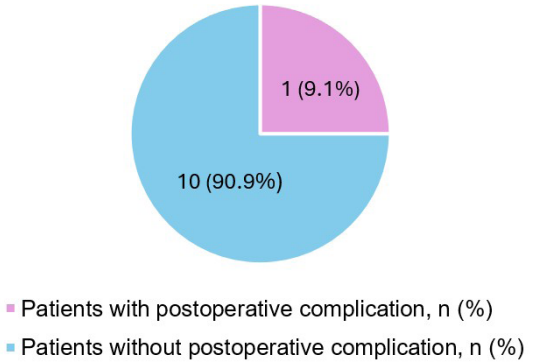

Fig. 4. Complications of submental Intubation at Hospital Teluk Intan between January 2022 and March 2025.

Discussion

Patient profile

Nasal intubation is routinely the first-line route of intubation in oral and maxillofacial surgery to ensure unobstructed access to the surgical field of the oral cavity. In this study, more than half the cases presented with fractures of the nasal bone and/or septum, approximately one-fifth with fractures of the base of skull, and another one-fifth sustained combined fractures of the nasal bone, septum, and base of the skull. Nasal intubation is contraindicated in these cases because it poses a risk of intracranial penetration, cerebrospinal fluid leakage, and meningitis.[4,5] Hence, submental intubation is the preferred and most reliable alternative, as it allows the surgeon to maintain dental occlusion throughout the intraoperative fixation of fractured bones.

Submental intubation is commonly performed in maxillofacial fracture surgery followed by orthognathic surgery.[1,7] In this study, the majority of the cases involved combined midface and mandibular fractures, with 3 patients presenting isolated midface fractures and only 1 with an isolated mandibular fracture. While nasal intubation is contraindicated in certain cases, oral intubation is also impractical because the endotracheal tube obstructs the surgical field and prevents the achievement of dental occlusion, which is essential for proper fracture fixation.

Technical modification

The same technique of submental intubation was performed by 2 oral and maxillofacial surgeons for all patients. In Altemir's original method, the suggested length of skin incision is 2 cm parallel to the mandibular lower border and about one fin-

ger-width below it.[1,2] In this study, a slightly smaller, paramedian incision of 1.5 cm was made on the submandibular region to minimise scarring. This incision length is sufficient to pass a flexometallic tube up to 7.5 mm size with minimal trauma and stress to the skin during exteriorisation.[1]

As the dissection closely follows the medial aspect of the mandible, a paramedian approach was used for all patients in this study with the rationale to avoid injury to the surrounding vital structures.[8] When this technique was originally introduced by Altemir in 1986, the median approach through the submental triangle was standard. However, in 2003, Altemir recommended the paramedian approach in the submandibular triangle to avoid damaging vital structures such as the anterior belly of the digastric muscle, the geniohyoid muscle insertion, and the submandibular gland duct.[2] Therefore, the paramedian approach is believed to be anatomically safer and associated with fewer postoperative complications.

While some surgeons prefer to use a single haemostat to exteriorise the endotracheal tube and pilot balloon, this technique risks creating a separate pathway for the tube after exteriorising the pilot balloon.[1] Various modifications and devices have been introduced to maintain the patency of the submental tunnel, including nasal speculums, dilators, pharyngeal loop, 2-0 silk suture, laparoscopic trocars, sterile disposable camera cable drapes, Nelaton catheters, dental needle cap fixations, percutaneous dilatational tracheostomy kits, and ultrasound-guided techniques.[1,2] In this study, double haemostats were used to exteriorise the endotracheal tube and pilot balloon sequentially. After creating the submental tunnel, the second haemostat was inserted guided by the first haemostat.[1] The haemostats then grasped and exteriorised the endotracheal tube and pilot balloon, respectively, one after another, maintaining a single continuous passage. Compared to device-assisted methods, using double haemostats is a cost-effective and straightforward technique in performing submental intubation.

The technique employed in this study was simple and time efficient, requiring only basic surgical instruments. The average duration of the procedure was under 10 minutes, comparable to previous reports.[6,7] Given its relative simplicity and speed, submental intubation remains a favourable airway route in maxillofacial surgery when nasal intubation is not feasible.

Complications

The complication rate of submental intubation in our study was low (9.1%), consistent with previous reports of 7% to 9%.[1,7] Only 1 out of 11 patients developed postoperative complications, a skin abscess and hypertrophic scar. This aligns with an earlier study identifying skin infection (3.5%) as the most common complication, followed by hypertrophic scar (1.2%), and orocutaneous fistula formation (1.1%).[1,5,7]

Compared to tracheostomy which is another alternative when nasal intubation is contraindicated, submental intubation is associated with fewer long-term complications and requires minimal postoperative care, making it a safer and less invasive airway route.[5]

The only complicated case involved the patient who developed a skin abscess on postoperative day 3. Although infection can result from improper aseptic technique,[9] all submental intubations adhered to the standard aseptic protocol, including preoperative skin disinfection and sterile draping. Routine antibiotic prophylaxis, 1.5 g of intravenous cefuroxime was given 1 hour preoperatively followed by postoperative doses for 1 week. Oral hygiene was maintained using 0.12% chlorhexidine 2 to 3 times a day postoperatively for 1 week.

The abscess formation most likely resulted from other factors such as saliva trickling from the intraoral wound, suboptimal wound closure, and contamination during the reversal from submental to oral intubation.[9] To minimise the risk of infection, Das *et al.* recommend avoiding overly tight skin sutures to allow drainage and leaving the mucosal wound to heal by secondary intention.[5] Accordingly, this study emphasises procedural sterility, controlled intraoral contamination, meticulous wound closure, postoperative wound care, broad-spectrum antibiotics, and oral hygiene maintenance.[5]

The same patient also developed a hypertrophic scar 2 weeks postoperatively, likely due to infection-induced inflammation impairing wound healing. The hypertrophic scarring may also be related to individual susceptibility to abnormal wound healing in response to skin inflammation.[10] Overactive fibroblasts producing excess collagen and growth factors contribute to hypertrophic scarring.[10] No treatment was provided as it was aesthetically acceptable to the patient and was well concealed below the lower border of the mandible.

Limitations

A key limitation of this study is its small sample size, as submental intubation is not the first-line route for airway management in maxillofacial fracture surgery and is therefore not routinely performed at this single-centre site. With only 1 patient experiencing postoperative complications, the 95% confidence interval was wide (0.2%–40.3%) limiting the precision of the estimate. Additionally, the retrospective design of this study introduces the risk of missing data and potential single-centre bias.

Future recommendations

The accuracy and generalisability of the study can be enhanced through larger prospective cohort studies or by pooling data from multiple centres. This study

demonstrated a high success rate for submental intubation with minimal postoperative complications when performed by trained clinicians. These findings reinforce the feasibility of submental intubation as a safe and effective alternative to tracheostomy in maxillofacial surgery when nasal intubation is contraindicated. Current anaesthesia training programmes in Malaysia offer limited exposure to submental intubation, highlighting a clear gap in curriculum design. The results of this study support the integration of structured submental intubation training into postgraduate curriculum and continuous professional development initiatives. Furthermore, interdisciplinary collaboration between anaesthesiologists and oral maxillofacial surgeons should be actively promoted to broaden the adoption of this technique.

Conclusion

This single-centre experience suggests that submental intubation is a feasible and safe alternative in maxillofacial surgery when oral and nasal intubation are not viable. With only 1 minor complication reported, it demonstrates the technique's low-risk profile when performed under aseptic conditions with proper postoperative care. Further research through larger prospective studies is needed to confirm these findings. Submental intubation remains an underutilised yet effective option for managing difficult airways—a clean, controlled and practical technique deserving of a place in the contemporary anaesthetist's repertoire.

Declarations

Ethics approval and consent to participate
The study was conducted in accordance with the Declaration of Helsinki and approved by the National Medical Research Register (RSCH ID-25-03214-SG7). Informed consent was obtained from patients for photography and publication purposes.

Competing interests
None.

Funding
None.

Acknowledgements
The authors would like to thank the Director-General of Health Malaysia for permission to publish this article and Ms. Chiew Shoen Chuen from Clinical Research Centre, Hospital Seri Manjung for her assistance in the research write-up.

References

1. Lim D, Ma BC, Parumo R, Shanmuhasuntharam P. Thirty years of submental intubation: a review. Int J Oral Maxillofac Surg. 2018;47:1161-1165. http://doi.org/10.1016/j.ijom.2018.04.015
2. Park KN, Karm MH. Submental/submandibular intubation: a journey from past to future. Anesth Pain Med. 2024;19(4):280-293. http://doi.org/10.17085/apm.24120
3. De Toledo GL, Bueno SC, Mesquita RA, et al. Complications from submental endotracheal intubation: a prospective study and literature review. Dent Traumatol. 2013;29:197-202. http://doi.org/10.1111/edt.12032
4. Williams KA, Tariq M, Acharekar MV, et al. Submental intubation in maxillofacial procedures: a more desired approach than nasotracheal intubation and tracheostomy. Cureus. 2022;14(7):e27475. http://doi.org/10.7759/cureus.27475
5. Das S, Das TP, Ghosh PS. Submental intubation: a journey over the last 25 years. J Anaesthesiol Clin Pharmacol. 2012;28(3):291-303. http://doi.org/10.4103/0970-9185.98320
6. Jundt JS, Cattano D, Hagberg CA, et al. Submental intubation: a literature review. Int J Oral Maxillofac Surg. 2012;41:46-54. http://doi.org/10.1016/j.ijom.2011.08.002
7. Goh EZ, Loh NHW, Loh JSP. Submental intubation in oral and maxillofacial surgery: a systematic review 1986–2018. Br J Oral Maxillofac Surg. 2020;58(1):43-50. http://doi.org/10.1016/j.bjoms.2019.10.314
8. Scafati CT, Maio G, Aliberti F, et al. Submento-submandibular intubation: is the subperiosteal passage essential? Experience in 107 consecutive cases. Br J Oral Maxillofac Surg. 2006;44:12-14. http://doi.org/10.1016/j.bjoms.2005.07.011
9. Tidke AS, Borle RM, Madan RS, et al. Transmylohyoid/submental endotracheal intubation in panfacial trauma: a paradigm shift in airway management with prospective study of 35 cases. Indian J Otolaryngol Head Neck Surg. 2013;65:255-259. http://doi.org/10.1007/s12070-012-0505-x
10. McGinty S, Siddiqui WJ. Keloid. Treasure Island (FL): StatPearls Publishing [Internet]; [cited 2025 Jan 1]. Available from: https://www.ncbi.nlm.nih.gov/books/NBK507899/