Case Report

Steroid as preventive treatment for transient facial nerve palsy in parotidectomy

Marlinda Adham*, Sellina Windri, Ibrahim Agung*****
*Department of Otorhinolaryngology Head and Neck Surgery
Dr. Cipto Mangunkusumo Hospital, Jakarta/Faculty of Medicine Universitas Indonesia,
**Faculty of Medicine, Universitas Indonesia
***Medical Rehabilitation Unit, Metropolitan Medical Centre Hospital

ABSTRACT

Background: One of the most reported complications of parotidectomy or other parotid surgery is facial nerve palsy. Steroids as glucocorticoid have been known to help preserve nerve damage. But there is lack of evidence that shows the use of steroids to help nerve recovery. **Purpose:** To find the advantage of steroid intervention, to prevent or to help accelerate recovery rate in facial nerve palsy side effect in parotidectomy patients. **Case report:** A 30-year-old male with pleomorphic adenoma of the parotid gland who had undergone superficial parotidectomy. Patient reported facial asymmetry following the procedure. **Clinical question:** Can steroid be used as preventive treatment for facial nerve palsy in parotidectomy? **Method:** This evidence-based case report used the PICO method for literature search in Ovid and PubMed. After selecting the articles using inclusion and exclusion criteria, the articles were appraised using the Center of Evidence Based Medicine (CEBM) Oxford appraisal tools. **Result:** Two articles were included for analysis and both showed no correlation between steroid administration and recovery rate. In contrary, one study showed that placebo-treated groups had a faster facial nerve function recovery rate than steroid-treated patients. **Conclusion:** Steroid administration following parotidectomy would not help accelerate the facial nerve function recovery rate. Prevention of facial nerve palsy in parotidectomy was preferred as treatment.

Keywords: facial nerve palsy, facial nerve paralysis, parotidectomy, steroid

ABSTRAK

Latar belakang: *Paralisis nervus fasialis merupakan salah satu komplikasi yang sering ditemukan pada operasi parotidektomi atau tindakan kelenjar parotid lainnya. Steroid memiliki kemampuan untuk mengurangi kerusakan saraf, namun kemampuan steroid dalam pemulihan kerusakan saraf masih belum jelas terbukti.* ***Tujuan:*** *Mengetahui manfaat pemberian steroid untuk mencegah terjadinya, atau mempercepat pemulihan paresis nervus fasialis pasca parotidektomi.* ***Laporan kasus:*** *Laki-laki 30 tahun dengan adenoma pleomorfik kelenjar parotis yang telah menjalani parotidektomi superfisial. Pasien melaporkan ketidaksimetrisan wajah pasca tindakan.* ***Pertanyaan Klinis:*** *Apakah steroid dapat diberikan sebagai pengobatan preventif untuk paresis nervus fasialis pada parotidektomi?* ***Metode:*** *Laporan kasus berbasis bukti ini menggunakan metode PICO pada dua pranala (Ovid dan PubMed), yang kemudian ditelaah kritis menggunakan* Center of Evidence Based Medicine (CEBM) Oxford appraisal tools. ***Hasil:*** *Pada 2 artikel yang bisa dianalisis, tidak terdapat korelasi pemberian steroid dengan kecepatan penyembuhan. Bahkan, ada satu penelitian yang melaporkan bahwa kelompok yang mendapat plasebo menunjukkan perbaikan fungsi nervus fasialis yang lebih cepat daripada kelompok yang diberi steroid.* ***Kesimpulan:*** *Pemberian steroid pada pasien pasca tindakan parotidektomi tidak terbukti mempercepat proses pemulihan kerusakan saraf. Pencegahan terhadap kerusakan nervus fasialis merupakan terapi yang diutamakan.*

Kata kunci: *paralisis nervus fasialis, parotidektomi, steroid*

Correspondence address: Marlinda Adham. Otorhinolaryngology Department, Cipto Mangunkusumo National Hospital, Faculty of Medicine Universitas Indonesia, Jakarta. E-mail: marlinda.adham@yahoo.com

INTRODUCTION

Parotid gland is the largest salivary gland located within the retromandibular fossa. This gland is divided into two lobes, the superficial lobe and deep lobe, by the facial nerve and the posterior facial vein. The facial nerve is essential for the motor function of the facial muscles, among others creating facial expressions. The facial nerve is divided into two different branches: the cervicofacial branches that supply the muscles of the mouth and neck region, and the temporofacial branches that supply the muscles of the forehead and the eye. The facial nerve, however, does not provide innervation into the parotid gland.[1]

Pleomorphic adenoma is the most common benign salivary tumors, with 85% of cases are of the parotid gland origin, followed by the salivary glands (10%) and submandibular glands (5%). Most benign parotid tumor, including pleomorphic adenoma, arises from the superficial lobe, and therefore can be removed through a procedure called the superficial parotidectomy. This procedure removes all glands that are located superficial to the facial nerve.[2]

Facial nerve palsy is one of the most reported side effects following parotidectomy. According to previous studies, the incidence of transient facial nerve palsy and permanent facial nerve palsy was approximately 12-40% and 0-9%, respectively. This complication was more commonly found in patients undergoing total parotidectomy compared to superficial parotidectomy.[3] Facial nerve identification when performing parotidectomy is crucial to prevent facial nerve injury. Two types of approach in identifying the facial nerve are through anterograde dissection and retrograde dissection of the facial nerve, with the anterograde approach being the preferred method. In anterograde approach, the main trunk is identified first, followed by the bifurcation and the facial nerve branches. Retrograde approach is the method of choice for revision parotidectomy, where the peripheral branches were identified first, and then traced back to the main trunk. Several anatomical landmarks are used to help identify the facial nerve trunk, such as the stylomastoid foramen, tympanomastoid suture, posterior belly of digastric, tragal pointer, mastoid process, as well as the posterior auricular artery.[4]

Following an injury, a series of neuroinflammatory reactions take place resulting in neural degeneration. Wallerian degeneration is a term used to describe the process in which axons and Schwann cells disintegrate and are slowly replaced by the regenerating axons. According to existing studies, Wallerian degeneration takes about 72 hours for it to complete, resulting in a non-stimulable nerve.[5] Facial nerve palsy is categorized into transient (lasting for less than 6 months) and permanent (lasting more than 6 months), with the former being the more common.[6] Nerve injury is classified according to the degree of injury. According to Seddon classification, first-degree injury, known as neuropraxia is commonly caused by blunt trauma that results in temporary conduction block, damaging the myelin sheath but not the axons. Second-degree injury or axonotmesis is the damage of the axon and its myelin sheath with an intact epineurium and no loss of the surrounding connective tissue, usually due to compression lesions. Third-degree injury or neurotmesis is a complete transection of the nerve, whose etiology is iatrogenic. Mechanism of injury is said to be due to iatrogenic neuronal stretching, thermal injury, and other forms of nerve injury. The known risk factors of facial

nerve palsy are the surgical subsite, tumor size, revision surgery, patients' age, and patients' history of diabetes mellitus.[7]

Steroid has long been used in attempt to obtain complete recovery of facial nerve palsy in Bells' palsy through several mechanisms: 1) reducing neural edema and perineural inflammation, 2) protecting the neural cells from peroxidation, 3) preventing the death of motor neurons, 4) reducing the rate of anterograde degeneration, and 5) promoting neural recovery.[8] A high-dose oral steroids of 50-60 mg daily, given for 10 days, are recommended to reduce inflammation and edema of the facial nerve. It has been found that the maximum benefit and better chance of complete recovery could be achieved when the steroids are commenced within 72 hours after the onset of symptoms.[9] In cases where the mechanism of facial nerve paralysis is likely due to complete transection, it is crucial to locate the site of injury and repair the nerve through a surgical measure called neuroraphy. Such as the administration of medical therapy, the exploration to locate nerve damage should be done within 72 hours since the onset of symptoms to ensure that the Wallerian degeneration has not been completed yet.[5]

The purpose of this case report was to find the benefit of steroid intervention in parotidectomy patients, to prevent or to help accelerate the recovery rate in facial nerve palsy cases.

CASE REPORT

A 30-year-old male presented to the clinic with a chief complaint of a painless mass on the right neck for 4 years. One year previously, he was diagnosed with lung tuberculosis, and the possibility of tuberculous lymphadenitis had to be eliminated. On physical examination, a hard, immobile tumor of approximately 2x2 cm was palpated between the right mandibular angle and right sternocleidomastoideus muscle. A fine needle aspiration (FNA) biopsy was performed, and the patient was diagnosed with pleomorphic adenoma.

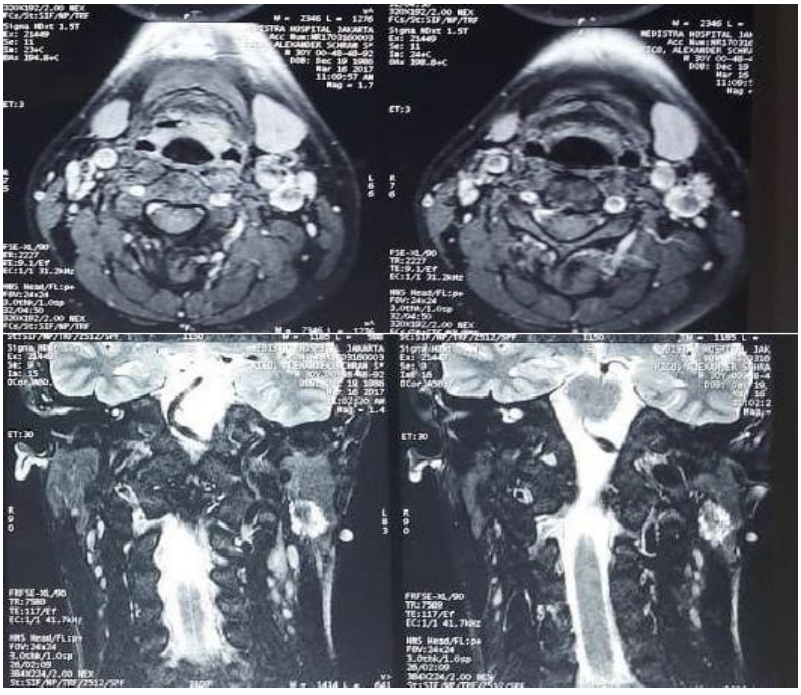

Figure 1. MRI result

The patient was planned for a superficial parotidectomy. A modified Blair skin incision was made at the tragus, down underneath the earlobe and extended back towards the ears. The facial nerve was identified in an antegrade manner, starting from the main trunk, followed by the branches. After identifying the facial nerves, the tumor was carefully removed. Intraoperative facial nerve monitoring was not carried out in this case.

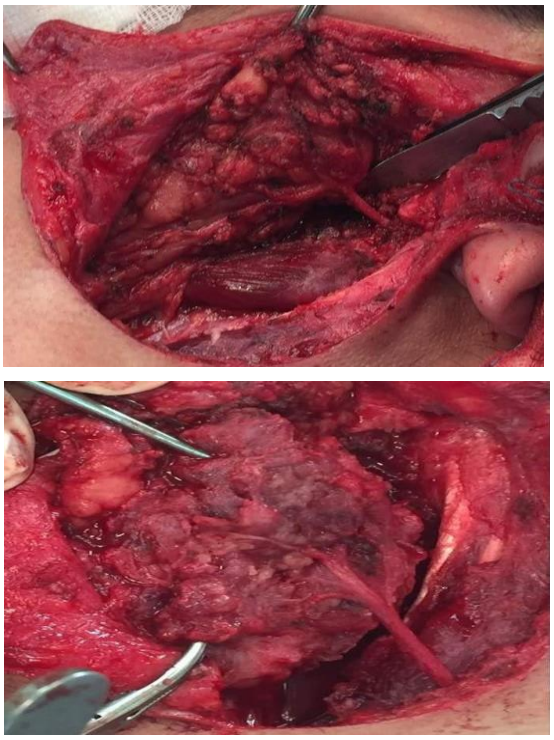

Figure 2. Intraoperative field

Following the surgery, facial asymmetry was observed. On further examination, there was a lack of movement on motion of the forehead and the eyebrows on the right side. The House-Brackmann's score was 4. The patient was unable to completely shut the right eye. Smiling deviation was noted due to a decreased right muscle activity compared to the left. There were no complaints of paresthesia, dry eyes, or excessive facial or gustatory sweating (Frey's syndrome).

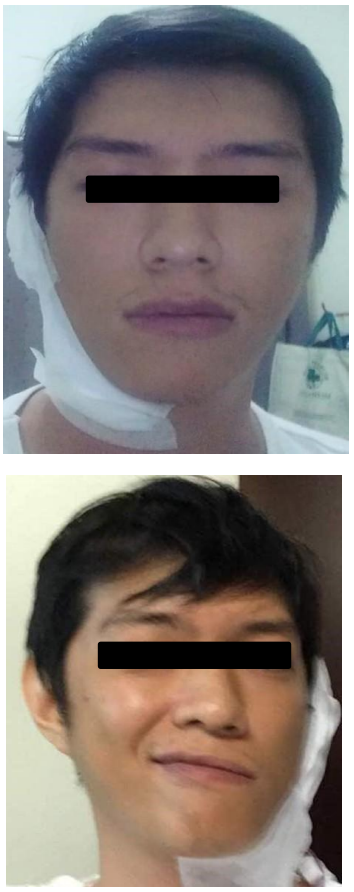

Figure 3. Facial asymmetry after the surgery

The patient was given a 10-day oral steroid regimen with prednisone. The initial dose was 50 mg per day for the first five days, followed by 30 mg per day for the next three days, and 10 mg per day for the last two days. The patient also underwent intensive physiotherapy sessions for 12 days consisting of laser therapy, faradic electro-stimulation, and facial massage. Physiotherapy sessions were continued once a week, for the next three months. The patient achieved complete recovery after four months.

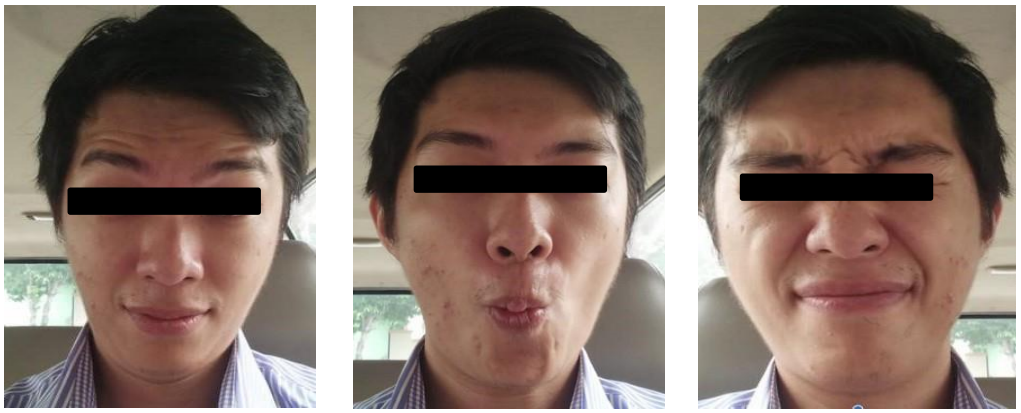

Figure 4. After recovery

CLINICAL QUESTION

"Can steroids be used as a preventive treatment for facial nerve palsy in parotidectomy?"

METHOD

The PICO used parotid tumor patient that underwent parotidectomy (population), steroid (intervention), placebo/not using steroid (comparison), and facial nerve palsy (outcome). The literature was searched in PubMed and Ovid. In each of these database, Boolean terms was used using the key terms "parotid neoplasm", "surgical procedure", "parotidectomy", "glucocorticoid", and "facial nerve paralysis", including the synonym and Medical Subjects Heading (MeSH) terms.

The inclusion criteria were: 1) articles written in English or Indonesian, 2) systematic review, meta-analysis, randomized controlled trial, 3) parotid tumor patients that already undergone parotidectomy, 4) experiencing facial nerve palsy, and 5) subjects were given glucocorticoid for post-operative therapy. The exclusion criteria were: 1) articles which were not available in full text, and 2) literature reviews.

RESULT

Both articles had the same conclusion that steroids (prednisolone and dexamethasone) were ineffective to prevent facial nerve palsy or help speed up recovery. In the study of Roh JL et al.[10], patients who underwent prednisolone treatment almost had the same recovery rate as placebo-treated patients ($p>0.1$). It took six months for both groups to achieve full recovery from facial nerve palsy. While Lee KJ et al.[11] study also showed the same results, giving high-dose or low-dose dexamethasone to patients with facial nerve palsy would not speed up the recovery process ($p= 0.239$). High-dose dexamethasone also showed giving no advantages than the low-dose. On the contrary, in this study, the placebo-treated group showed a faster recovery rate than dexamethasone-treated group. Median time to full recovery facial nerve function was 60 days in the placebo-treated group and 150 days in the dexamethasone-treated group.

In our case, FNA biopsy was performed and the result was pleomorphic adenoma, and superficial parotiedectomy was executed.

DISCUSSION

Among all the salivary gland tumors, parotid tumor contributed to almost 80% of the cases, followed by the tumor of the submandibular glands and sublingual glands.[1,2] It has been long recognized that

most tumors that arise in the parotid gland are benign. Among these, pleomorphic adenoma and Warthin tumor are the most frequently occurring benign neoplasms in the parotid gland. Typically, these two conditions can be easily identified through cytology, making Fine Needle Aspiration (FNA) a valuable diagnostic technique for assessing parotid nodules. Nevertheless, it has been reported that FNA examinations can yield false-negative results in up to 20% of cases. Frozen section is more commonly used in cases where the results of FNAC (Fine Needle Aspiration Cytology) indicate non-diagnostic or intermediate tumors, or when the clinical condition raises suspicion of malignancy.[4,12]

In this case, fine needle aspiration biopsy was performed and the result was pleomorphic adenoma. As mentioned above in the introduction, the preferred surgical approach for pleomorphic adenoma is superficial parotidectomy.

The exact etiology of facial nerve palsy following parotidectomy in cases where the facial nerve is anatomically intact is still poorly understood. However, it was proposed that neural stretching or elongation, heat injury as the result of electrocautery use, and tissue hypoxia be the mechanism of injury.[13] Unless there is an evidence of complete neural transection, facial nerve palsy following superficial parotidectomy is classified as a first-degree injury, which explains the complete reversibility nature of the event. Several risk factors of post superficial parotidectomy facial nerve injury are old age, malignancy, tumor size, revision surgery and longer operating time.[14]

In superficial parotidectomy, the facial nerve is preserved by identifying the facial nerve before tumor dissection. In the present case, identification of the facial nerve was made in an antegrade manner, where the main trunk of the facial nerve is identified first, followed by the branches.[6] Aishikumar et al.[14] (2018) reported no significant difference between antegrade versus retrograde approaches in the incidence of transient facial palsy (TNP). However, the retrograde approach is a more efficient and less time-consuming procedure. This is similar to a meta-analysis study conducted by Mashrah et al.[15] (2018), which analyzed 10 controlled randomized studies and 6 retrospective studies, and reported that there is no evidence demonstrating a significant advantage of one approach over another. Unlike the study by Khazaeni et al.[16] (2022), which reported that retrograde dissection resulted in higher intraoperative bleeding and longer hospital stays, the differences, although statistically significant, are not clinically important. Therefore, the experience and knowledge of surgeons regarding the two approaches are of utmost importance.[15] Previous study mentioned that long operating time might be a risk factor for transient facial nerve palsy, which may explain the occurrence of transient FNP in this case, as an antegrade approach may result in a longer operating time.[7]

The patient in the present case, received a 10-day regimen of prednisone that was tapered accordingly. However, recent evidence suggested that steroid therapy following parotidectomy facial nerve palsy did not result in an improved chance of full recovery or faster recovery time in both transient and permanent facial nerve palsy (FNP).[17,18] The reason was that the postulated etiology of FNP following parotidectomy was due to neural stretching and not neural edema, which is the pathophysiology of FNP in Bell's Palsy.[15] Varadharajan et al.[18] (2015), conducted a systematic review that analyzed two randomized controlled trials. The study results revealed that there was no significant difference in the outcome of FNP after parotidectomy when comparing the administration of corticosteroids versus no treatment. It was noted that most cases of FNP following parotidectomy were temporary. Factors like tumor size and malignancy prior to surgery, as well as the extent of the

parotidectomy and the condition of the facial nerve at the conclusion of the operation, were identified as significant determinants in predicting the prognosis of FNP in case it did occur. Similar results were reported in studies conducted by Lee et al.[11] and Talati et al.[19]

It was noted that electrical stimulation therapy with correct electrode placement on the areas of the targeted muscles in Bell's palsy patient yielded a favorable outcome.[14] Another mode of therapy used in this case was laser therapy. Laser therapy had been studied to help nerve regeneration, similar to electrical stimulation. Even though laser therapy had a different mechanism to electrical stimulation, there was no significant difference between laser therapy and electrical stimulation in improving facial symmetry and function in patients with acute Bell's palsy.[20] A randomized control trial on patients with Bell's palsy reported that adding a laser therapy regimen was more effective in the clinical recovery of FNP than facial massage and facial exercises alone, and that high-intensity laser therapy was superior to low-level laser therapy.[7]

Several preoperative and intraoperative measures could be taken to prevent the incidence of transient facial palsy following superficial parotidectomy especially in cases like this, where the patient was at low risk of neural complications. A preoperative magnetic resonance imaging (MRI) or computerized tomography (CT) scan might be necessary to visualize the tumor and its relationship with the facial nerve. Medical imaging plays a vital role in assessing salivary gland tumors. Conventional computerized tomography (CT) is used to evaluate tumor extent, bony infiltration, and lymphadenopathy however, it has limitations due to dental artefacts and poor soft-tissue resolution, potentially leading to underestimation of lesions. For a more comprehensive evaluation of tumors in the deep parotid lobe, sublingual glands, and minor salivary glands, MRI is recommended. MRI provides detailed information about tumor extent, soft tissue invasion, nerve involvement, and demonstrates higher sensitivity and specificity in detecting perineural spread. In this case, a perioperative MRI was done to assess the nature of the tumor, as well as mapping the tumor.[21]

Few studies had highlighted the importance of intraoperative facial nerve monitoring in mapping the trunk and branches of the facial nerve, and evaluating neural function throughout the procedure. Covering the identified nerves with gauze can also help to minimize direct contact with dry air. Other measures involve using more advanced tools such as surgical magnification, diathermy scissors, ultrasound scalpel, and water-jet-dissection.[15] Significant efficacy of intraoperative facial nerve monitoring was reported by Savvas et al.[22] (2016), who evaluated patients undergoing superficial parotidectomy. At the initial follow-up after surgery, 85.4% of the 123 patients who had undergone monitored surgery, exhibited regular facial nerve function. In contrast, among the control group consisting of 99 patients, only 53.5% showed normal facial nerve function. This was similar to a meta-analysis that included 546 patients, by Sood et al.[23] (2015), that showed a statistically significantly lower prevalence of transient deterioration of facial nerve function in monitored patients (22.5% vs. 34.9%; p=0.001). But there was a difference with the study conducted by Grosheva et al.[24] (2009), which reported no statistically significant difference (p=0.2) between the groups of patients who underwent surgery, with and without monitoring in terms of the prevalence of facial nerve paresis.

To summarize, transient nerve palsy is one of the most common complications following parotidectomy, even in a low-risk individual. Neural stretching or elongation, the proposed etiology of neural palsy in this case, might be prevented by accurately identifying

the facial nerve preoperatively, using MRI/CT or intraoperatively through neural monitoring. Medical rehabilitation involving laser therapy and electrical stimulation therapy alongside facial muscle exercises immediately after the event, could help achieve faster and complete recovery, but no evidence that support the using of steroids could help achieve faster recovery. Therefore, it could be concluded that steroids administration in post-parotidectomy patients might not boost faster facial nerve palsy recovery rate.

ACKNOWLEDGEMENT

The authors reported no conflicts of interest in this work.

REFERENCE

1. Chason HM, Downs B. Anatomy, head and neck, parotid gland [Internet]. U.S. National Library of Medicine; 2022 [cited 2024 Apr 18]. Available from: https://www.ncbi.nlm.nih.gov/
2. Jain S, Hasan S, Vyas N, Shah N, Dalal S. Pleomorphic adenoma of the parotid gland: Report of a case with review of literature. Ethiopian Journal of Health Sciences. 2015 Apr 21;25(2):189. doi:10.4314/ejhs.v25i2.13
3. Siddiqui AH, Shakil S, Rahim DU, Shaikh IA. Post parotidectomy facial nerve palsy: A retrospective analysis. Pak J Med Sci. 2020;36(2):126-30.
4. Saha S, Pal S, Sengupta M, Chowdhury K, Saha VP, Mondal L. Identification of facial nerve during parotidectomy: A combined anatomical & surgical study. Indian J Otolaryngol Head Neck Surg. 2013 Jul 24;66(1):63–8. doi:10.1007/s12070-013-0669-z
5. Mistry RK, Hohman M, Al-Sayed A. Facial nerve trauma [Internet]. U.S. National Library of Medicine; 2023 [cited 2024 Apr 18]. Available from: https://www.ncbi.nlm.nih.gov/
6. Kurz A, Volk GF, Arnold D, Schneider-Stickler B, Mayr W, Guntinas-Lichius O. Selective Electrical Surface Stimulation to Support Functional Recovery in the Early Phase After Unilateral Acute Facial Nerve or Vocal Fold Paralysis. Front Neurol. 2022;13:869900.
7. Lamieras AR, Estibero H, Montalvao P, Magalhaes M. Predictive factors of facial palsy after parotidectomy: analysis of 166 operations. Revista Espanola de Cirugia Oral y Maxilofacial. 2018;41(3):109-14.
8. Charoenlux P, Utoomprurkporn N, Seresirikachorn K. The efficacy of corticosteroid after facial nerve neurorrhaphy: A systematic review and meta-analysis of randomized controlled trial. Braz J Otorhinolaryngol. 2023 Jan;89(1):79–89. doi:10.1016/j.bjorl.2021.09.005
9. Somasundara D, Sullivan F. Management of Bell's Palsy. Australian Prescriber. 2016 Jun 1;40(3):94–6. doi:10.18773/austprescr.2017.030
10. Roh JL. Park CI. A prospective, randomized trial for use of prednisolone in patients with facial nerve paralysis after parotidectomy. The American Journal of Surgery. 2008. 196, 746–750. DOI: 10.1016/j.amjsurg.2008.04.010
11. Lee KJ, Fee WE Jr, Terris DJ. The efficacy of corticosteroids in postparotidectomy facial nerve paresis. Laryngoscope. 2002 Nov;112(11):1958-63.
12. Pastorello RG, Rodriguez EF, McCormick BA, Calsavara VF, Chen LC, Zarka MA, Schmitt AC. Is there a Role for Frozen Section Evaluation of Parotid Masses After Preoperative Cytology or Biopsy Diagnosis? Head Neck Pathol. 2021 Sep;15(3):859-865.
13. Jin H, Kim BY, Kim H, Lee E, Park W, Choi S, et al. Incidence of postoperative facial weakness in parotid tumor surgery: a tumor subsite analysis of 794 parotidectomies. BMC Surg. 2019;19(1):199.
14. Ashishkumar M, Pradeep P. Comparison of antegrade versus retrograde facial nerve dissection in cases of superficial parotidectomy for pleomorphic adenoma of parotid gland. International Surgery Journal. 2018;5(5):1749-52.
15. Mashrah MA, Al-Dhohrah TA, Al-Zubeiry FA, Yan L, Al-Hamed FS, Zhao X, Pan C. Antegrade versus retrograde facial nerve dissection in benign parotid surgery: Is there a difference in postoperative outcomes?

A meta-analysis. PLoS One. 2018 Oct 19;13(10):e0206028. doi: 10.1371/journal.pone.0206028. Erratum in: PLoS One. 2020 Nov 10;15(11):e0242299.

16. Khazaeni K, Rasoulian B, Sadramanesh E, Vazifeh Mostaan L, Mashhadi L, Gholami G. Comparing Antegrade and Retrograde Parotidectomy: Surgical Parameters and Complications. Iran J Otorhinolaryngol. 2022 Mar;34(121):83-88.
17. Ghazizadeh S, Badran K, Kuan E, St. John M. Does the Use of Steroids Perioperatively in Parotid Surgery Affect Facial Nerve Outcomes? The Laryngoscope. 2018; 128:2433-4.
18. Varadharajan K, Beegun I, Daly N. Use of steroids for facial nerve paralysis after parotidectomy: A systematic review. World J Clin Cases. 2015;3(2):180-5.
19. Talati V, Brown HJ, Losenegger T, Revenaugh P, Al-Khudari S. Patient safety and quality improvements in parotid surgery. World J Otorhinolaryngol Head Neck Surg. 2022 Apr 27;8(2):133-138
20. 20. Javath J. M., D'Souza A. F., R. RS. Low-level Laser Therapy Versus Electrical Stimulation for the Management of Acute Bell's Palsy: A Randomized Clinical Trial. Physical Treatments. 2021;11.
21. Alvi S, Chudek D, Limaiem F. Parotid Cancer. [Updated 2023 May 19]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK538340/
22. Savvas E., Hillmann S., Weiss D., Koopmann M., Rudack C., Alberty J. Association between facial nerve monitoring with postoperative facial paralysis in parotidectomy. JAMA Otolaryngol Head Neck Surg. 2016;142(9):828–833. doi: 10.1001/jamaoto.2016.1192.
23. Sood A. J., Houlton J. J., Nguyen S. A., Gillespie M. B. Facial nerve monitoring during parotidectomy: a systematic review and meta-analysis. Otolaryngol Head Neck Surg. 2015;152(4):631–637. doi: 10.1177/0194599814568779
24. Grosheva M., Klussmann J. P., Grimminger C., et al. Electromyographic facial nerve monitoring during parotidectomy for benign lesions does not improve the outcome of postoperative facial nerve function: a prospective two-center trial. Laryngoscope. 2009;119(12):2299–2305. doi: 10.1002/lary.20637