# A study to compare retrogrades facial nerve dissection and conventional antegrade technique for parotidectomy in benign parotid disease

**[1]Dr. Arunkumar Tukaram,[2]Dr. Md. Zaheeruddine Ather,[3]Dr. Arunkumar Bhavikatti, [4]Dr sharankumar Jabshetty**

[1,2]Associate Professor, Department of General Surgery,ESIC Medical College, Gulbarga, Karnataka, India
[3]Assistant Professor, Department of General Surgery,ESIC Medical College, Gulbarga, Karnataka, India
[4]Senior Resident, Department of General Surgery,ESIC Medical College, Gulbarga, Karnataka, India

**Corresponding Author:** Dr. Arunkumar Tukaram

## Abstract
The antegrade approach is the conventional/standard technique of identification and dissection of the facial nerve. It is usually the standard procedure for a trainee to master6. The technique involves identification of the facial nerve trunk as it leaves the stylomastoid foramen. This is accomplished through identification of the nerve trunk via its relationship with the tympanomastoid suture, the tragal pointer or the posterior belly of the digastric. During the study period of 20 month 37 patients with benign parotid disease who underwent surgery were included in study group. Based on the surgeon expertise and familiarity with the technique of facial nerve dissection 17 patients underwent retrograde dissection of facial nerve for parotidectomy and was grouped as retrograde group. In retrograde group, surgeons with a good experience of retrograde technique performed all surgery. 45% patients in antegrade group vs. 2 (11.76%) patients in retrograde group recovered completely at 1 month interval. We tested difference between the groups in facial nerve injury recovery at 1month by applying Fischer's exact test p= 0.028 and it was found to be statistically significant.

**Keywords:** Retrogrades facial nerve dissection, conventional antegrade technique, parotidectomy

## Introduction
Facial nerve is a very important nerve which exists through skull base below ear lobule and travels through parotid gland separating gland into superficial and deep lobes[1]. The hazardous course of facial nerve through parotid gland has risked parotidectomy for nerve injury. Incidence of facial nerve injury is higher in total than superficial parotidectomy which may be related to stretch injury or as a result of surgical interference with vasa nervorum. Advanced age longer operation time and larger specimen will have the significant risk for transient facial palsy after conservative parotidectomy[2]. Parotidectomy is a common

surgical procedure for the treatment of benign and malignant lesions of the parotid gland. On account of the fact that the terminal branches of the facial nerve are closely related to the parotid gland, identification, protection, and preservation of the facial nerve is central for successful parotid surgery. Two approaches, antegrade and retrograde are commonly used to identify and dissect the facial nerve[3].

The antegrade approach is the conventional/standard technique of identification and dissection of the facial nerve. It is usually the standard procedure for a trainee to master[4]. The technique involves identification of the facial nerve trunk as it leaves the stylomastoid foramen. This is accomplished through identification of the nerve trunk via its relationship with the tympanomastoid suture, the tragal pointer or the posterior belly ofthe digastric. It is well known that the location of the nerve trunk may challenge even an experienced surgeon who operates on obese patients, especially those with large tumours or during revision surgery. Other authors have also suggested that exposure of the trunk is not necessary in limited superficial parotidectomy for the treatment of localized tumours, and its avoidance may reduce the risk of serious nerve damage. Recent beliefs among surgeons in a more conservative surgical approach to benign parotid tumours and the technological improvements in perioperative monitoring of the facial nerve have renewed the interest in the antegrade approach to facial nerve dissection in parotid surgery, for benign tumors[5]. The retrograde approach involves identification of the peripheral branches of the facial nerve, using soft tissue landmarks. It has been observed that soft tissue landmarks of the peripheral branches are easier to identify than is commonly thought especially with the aid of the facial nerve stimulator. It is more popular in china with encouraging results[6].

**Methodology**
Patients visiting to surgery department with parotid swelling were subjected to careful history taking, complete clinical examination, and examination of facial nerve integrity. Clinical diagnosis made was confirmed with USG (ultra sonography) parotid and FNAC (fine needle aspiration cytology). FNAC tissue diagnosis was recorded, pleomorphic adenoma, warthins tumor, neurofibroma.

During the study period of 20 month 37 patients with benign parotid disease who underwent surgery were included in study group.

Based on the surgeon expertise and familiarity with the technique of facial nerve dissection 17 patients underwent retrograde dissection of facial nerve for parotidectomy and was grouped as retrograde group.

In retrograde group, surgeons with a good experience of retrograde technique performed all surgery.

20 patients underwent antegrade dissection of facial nerve for parotidectomy and were grouped under antegrade group. Majority of surgeon used routinely antegrade technique.

In both the techniques facial nerve monitoring was not used.

**Clinical examination**
Facial nerve integrity-all patients had normal facial nerve function pre operatively clinicaldiagnosis.

**Intraoperative findings recorded**
Type of technique used for dissection of facial nerve during parotidectomy Antegrade or Retrograde or Combined. Success rate of each technique for facial nerve identification and braches dissection. Type of surgery done recorded as: Superficial parotidectomy, Total conservative parotidectomy.

Operative time required for procedure recorded, from skin incision to skin closure in hours.

**Post-operative period data recorded**

Presence or absence of facial nerve injury in both the techniques.Haematoma-was diagnosed and recorded by clinical examination, Wound infection-by culture of organism in wound discharge.

**Follow up period data recorded**

At 1 week the facial nerve examination done as per House Brackmann grading scale and grades of facial nerve injury were recorded as no injury grade (I)/mild injury grade (II) and serious nerve injury included grade(III-IV).

**Inclusion criteria**

- Patients undergoing parotidectomy for benign parotid disease.
- Patients having normal facial nerve integrity.

**Exclusion criteria**

- Parotid neoplasm with facial nerve involvement pre operatively.
- Parotid neoplasm diagnosed as malignant
- Pediatric patients (less than 12 years).
- Patients unfit for surgery.

**Results**

**Table 1:** Distribution according to Facial Nerve injury as graded by HB grading scale at 1 week

| Facial nerve injury | Antegrade groupNo. (%) | Retrograde groupNo. (%) |
|---|---|---|
| Grade I/IIno injury/mild injury | 10 (50%) | 2 (11.76%) |
| Grade III/IV serious injury | 10 (50%) | 15(76.47%) |
| Total | 20 (100%) | 17 (100%) |
| $X^2$= 6.13, p= 0.013(Significant) | | |

House Brackmann grading scale was used for grading facial nerve injury:
10 (50%) patients in antegrade group vs. 2 (11.76%) patients in retrograde group had no/mild facial nerve injury. 10 (50%) patients in antegrade group vs.15(76.47%) patients in retrograde group had serious nerve injury (grade III/IV).
No patients in either group had facial nerve injury above Grade IV.
We tested difference between the groups in facial nerve injury as graded by HB grading scale at 1 week by applying chi-square test and it was found to be significant p=0.013.
Implying that antegrade group had more number of patients with no/mild facial nerve injury compared to retrograde group.

**Table 2:** Distribution according to Facial Nerve injury as graded by HB(House Brackmann) grading scale at 1 month

| Facial nerve injury | Antegrade groupNo. (%) | Retrograde groupNo. (%) |
|---|---|---|
| Grade I/IIno injury/mild injury | 12 (60%) | 2 (11.76%) |
| Grade III/IV Serious injury | 8 (40%) | 15(76.47%) |

| | | |
|---|---|---|
| Total | 20 (100%) | 17 (100%) |
| $X^2$= 3.46, p= 0.063(NS) | | |

12(60%) Patients in antegrade group vs. 2(11.76%) patients in retrograde group had no/mild facial (Grade I/II) nerve injury. 8 (40%) patients in antegrade group vs. 15(76.47%) patients in retrograde group had serious nerve injury (grade III/IV), at 1month period.

We tested difference between the groups in facial nerve injury as graded by HB grading scale at 1 month by applying chi- square test and it was found to be not statistically significant p=0.063.

Implying that even clinical significance seems from table but statistical difference is not present between the above groups.

**Table 3:** Distribution according to Facial Nerve injury as graded by HB grading scale at 4 months

| Facial nerve injury | Antegrade groupNo. (%) | Retrograde groupNo. (%) |
|---|---|---|
| Grade I/II no /mild injury | 20 (100%) | 13 (76.47%) |
| Grade III/IV Serious injury | 0 | 4 (23.53%) |
| Total | 20 (100%) | 17 (100%) |
| Fischer's exact test p= 0.383(NS) | | |

20 (100%) Patients in antegrade group vs. 13 (76.47%) patients in retrograde group had no/mild facial (Grade I/II) nerve injury.

4 (23.53%) patients in retrograde group had serious nerve injury (grade III/IV), at 4month period. Retrograde group were slower to recover from grade III/IV nerve injury compared to antegrade group.

We tested difference between the groups in facial nerve injury as graded by HB grading scale at 14month by applying chi-square test and it was found to be not statistically significant p=0.383.

**Table 4:** Distribution according to complete recovery of facial nerve injury at 1 week

| Recovery | AntegradeNo. (%) | RetrogradeNo. (%) |
|---|---|---|
| Complete recovery | 8 (40%) | 2 (11.76%) |
| Not recovered | 12 (60%) | 15 (88.23%) |
| Total | 20 (100%) | 17 (100%) |
| Fischer's exact test p= 0.073(NS) | | |

(40%) patients in antegrade group vs. 2 (11.76%) patients in retrograde group recovered completely at 1week interval.

We tested difference between the groups in facial nerve injury recovery at 1 week by applying Fischer's exact test p= 0.073 and it was found to be not statistically significant.

**Table 5:** Distribution according to complete recovery of facial nerve injury at 2 months

| Recovery | AntegradeNo. (%) | RetrogradeNo. (%) |
|---|---|---|
| Complete recovery | 9 (45%) | 2 (11.76%) |
| Not recovered | 11 (55%) | 15 (88.23%) |
| Total | 20 (100%) | 17 (100%) |
| Fischer's exact test, p= 0.028 | | |

8 (45%) patients in antegrade group vs. 2 (11.76%) patients in retrograde group recovered completely at 1 month interval.

We tested difference between the groups in facial nerve injury recovery at 1month by

applying Fischer's exact test p= 0.028 and it was found to be statistically significant. Implyingthat patients who underwent antegrade dissection for facial nerve recovered quickly than retrograde group at 1month interval.

**Table 6:** Distribution according to complete recovery of facial nerve injury at 4 months

| Recovery | AntegradeNo. (%) | RetrogradeNo. (%) |
|---|---|---|
| Complete recovery | 20 (100%) | 13(76.47%) |
| Not recovered | 0 | 4 (23.52%) |
| Total | 20 (100%) | 17 (100%) |
| Fischer's exact test, p= 0.036 (significant) | | |

All 20/20 patients in antegrade group vs. 13(76.47%) patients in retrograde group recovered completely at 4-month interval.

Remaining 4 patients in antegrade group had mild facial nerve injury at 4 month period which recovered completely by 6 month time.

Retrograde group had slow recovery rate than antegrade group.

We tested difference between the groups in facial nerve injury recovery at 4 month by applying Fischer's exact test p= 0.036 and it was found to be significant.

Implying that the patients who underwent antegrade dissection for facial nerve recovered quickly than retrograde group at 4month interval.

**Table 7:** Distribution of patients according to post-operative complications

| Complications | AntegradeNo. (%) EER | RetrogradeNo.(%) CER |
|---|---|---|
| Wound infection | 0 | 1 (5.88%) |
| Haematoma | 0 | 1(5.88%) |
| Frey's Syndrome | 1 (5%) | 2(11.76%) |
| Fistula | 1 (5%) | 3 (17.65%) |
| Temporary facial nerve injury | 12 (60%) | 15 (88.24%) |
| Total number ofcomplications | 14 | 20 |

Major complication of parotidectomy is facial nerve injury.

Antegrade group had total 14 complications in 20 surgeries: 12(60%) patients had temporary facial nerve injuries, Frey's syndrome and fistula 1(5%)of patients each. Even two complications existed in single case.

Retrograde group had total 20 complications in 17 surgeries: 15(88.24%) of patients had temporary facial nerve injuries, 3(17.65%)of patients had fistula, 2(11.76%) with frey's syndrome single each case of wound infection and haematoma.

Observing above result antegrade with less number of complications is better technique than retrograde technique.

**Table 8:** Distribution of patients according to post-operative complications (NNT)

| Complication | Antegrade No.(%) EER | Retrograde No.(%) CER | ARR (EER-CER) | NNT=1/ARR |
|---|---|---|---|---|
| Temporary facial nerve injury | 12 (60%) | 15 (88.24%) | 0.88-0.60=0.28 | 1/0.28=3.57=4 |
| Fistula | 1 (5%) | 3 (17.65%) | 0.17-0.005=0.12 | 1/0.12=8.33=8 |

Applying number needed to test (NNT).

NNT is calculated on the basis of risks associated with each of the intervention Usually the risk will be assessed in terms of complications of surgeries in two groups So the major complications in our series:

## 1. Temporary facial nerve injury

12(60%) of Patients treated in antegrade group vs. 15(88.24%) of patients treated in retrograde group had temporary facial nerve injury. How many patients need to be treated with antegrade technique to prevent one bad outcome (temporary facial nerve injury) is calculated as shown below.
CER = Control group event rate (retrograde group).
EER = Experimental group event rate(antegrade group).
ARR=CER-EER=(88.24%)-60%=0.88-0.60=0.28.
NNT=1/ARR=1/0.28=3.57=4.

Implying that we have to treat 4 patients with antegrade technique to prevent one additional bad outcome like temporary facial nerve injury.

## Fistula

1 (5%) Of Patients treated in antegrade group vs. 3 (17.65%) of patients treated in retrograde group had Fistula. How many patients need to be treated with antegrade technique to prevent one bad outcome (Fistula) is calculated as shown below.
CER = Control group event rate (retrograde group).
EER = Experimental group event rate(antegrade group).
ARR= CER-EER=0.17-0.005=0.12.
NNT=1/ARR=1/0.12=8.33=8.

Implying that we have to treat 8 patients with antegrade technique to prevent one additional bad outcome like fistula.

## Discussion

In this study 50%(10/20) of patients in antegrade group had grade I/II facial nerve injury as per HB(House Brackmann) grading scale compared to 11.76%(2/17) patients of retrograde group at 1 week of surgery. Serious nerve injury grade III/IV was observed more in retrograde group than antegrade group 15(76.47%) vs. 10 (50%) patients respectively. Statistically significant difference existed between both the groups p=0.013 Implying that antegrade group had more number of patients with no/mild facial nerve injury (grade I/II) compared to retrograde group. Similar study conducted by.Barry O'Regan*et al*.,[7] showed antegrade group had50% (10/20) patients with mild facial nerve injury HB (I/II) vs. 40%(8/20) patients in retrograde group at 1 week. Results were similar to present study.
At 1month follow up antegrade group had 60% (12/20) patients with HB grade (I/II), no/Mild facial nerve injury compared to 11.76% (2/17) patients of retrograde group. At this time 2 patients who were in serious nerve injury category in antegrade group at 1 week recovered and had mild nerve injury at 1month follow up, but none of patients who were labeled as serious nerve injury group in retrograde at 1 week recovered. Retrograde group having serious nerve injury grade III and above were slow to recover compared to antegrade group. These results were contrary to similar study conducted by Barry O'Regan*et al*., [7] where antegrade had 65%(13/20)vs. 75%(15/20)patients of retrograde group who had HB grade(I/II),mild facial nerve injury.
At 4month of follow up 100%(20/20) of patients in antegrade group had no/mild facial nerve injury on HB grading scale vs. 76.47%(13/17) of patients in retrograde group.Results were contrary to study conducted by Barry O'Regan*et al*., [7] were 100%(20/20) of patients in retrograde group had no/mild facial nerve injury vs. 85%(18/20) patients in antegrade group.
40%(8/20)patients in antegrade group recovered completely and were having normal facial

nerve function compared to only 11.76%(2/17) patients in retrograde group at 1 week. 45% (9/20) patients recovered completely in antegrade group compared to 11.76% (2/17) patients in retrograde group at 1month duration.

All the patients in antegrade group recovered completely 100% (20/20) compared to 76.47%

(13/4) patients in retrograde group at 4 month duration. Result was contrary to study conducted by Barry O'Regan*et al.*,[7] concluded that Patients in the retrograde group seemed to recover from serious nerve injury faster than in the antegrade group. Proportionately more had fully recovered in the retrograde group than in the antegrade group at 1 month and 3 months. Another study conducted by Henney SE*et al.*, [8] showed 38% of temporary facial nerve palsies resolved within 1 month, 78% within 3 months and all recorded resolved within 7 months. In our present study remaining 24% (4/17) patients recovered completely by 6 month duration.

Postoperative facial nerve dysfunction occurred in 60% (12/20) of antegrade group, 88% (15/17) of retrograde group. Overall facial nerve dysfunction in our series was 72.9% (27/37), which was slightly higher than the 30-60% reported incidence in thepublished work of Bron and O'Brien[9]. Upton *et al.*,[10],stated that temporary postoperative facial nerve weakness ranges between 18 and 65%. Similar results are reported by Nouraei*et al.*,[11]in whose study 40% of patients had some degree of postoperative facial nerve dysfunction. In a recent report on retrograde nerve dissection during parotidectomy, about 66% of the patients had transient nerve weakness after one week, however, after six months, 99% of the patients had normal nerve function study conducted by Barry O'Regan, G. Bhardwaj.

The higher incidence temporary facial nerve palsy in our series can be explainedto doing total conservative parotidectomy as a procedure of choice to eliminate the risk of recurrence and to minimize morbidity due to recurrence.

Retrograde group had more number of complications 20complications vs. 14complications in antegrade group. Study conducted by K.Anjum, P.J.Revington*et al.*,[12]compared the complications in two similar groupsincluding89 patients and found no significant difference, concluding retrograde facial nerve dissection as an alternative technique.

## Conclusion

- Conventional antegrade technique is better technique as compared to retrograde technique as the grade of facial nerve injury as per House Brackmann grading scale were milder forms and the serious nerve injuries in antegrade technique recovered rapidly compared to alternative retrograde technique.
- We recommend antegrade technique over retrograde technique, observing the postoperative complications, which were less in antegrade technique as compared to retrograde technique.

## References

1. Bhattacharyya N, Richardson ME, Gugino LD. An objective assessment of the advantages of retrograde parotidectomy. Otolaryngol Head Neck Surg. 2004;131:393-6.
2. Dr. AarushiKataria, Dr. Naveen Nandal and Dr. Ritika Malik, Shahnaz Husain -A Successful Indian Woman Entrepreneur, International Journal of Disaster Recovery and Business ContinuityVol.11, No. 2, (2020), pp. 88–93
3. Malik, R., Nandal, Naveen and Gupta, Prakhar. (2021), The Impact of online shoppers to price and quality: a survey study in Delhi-NCR, Efflatounia, 5 (2), pp. 376 – 389.
4. Gunn A. Benign tumours of the parotid and submandibular gland. In: Norman JE,McGurk M, editors. Colour atlas and text of salivary glands. New York: Mosby-Wolfe, 1995, 146.
5. Zhao K, Qi DY, Wang LM. Functional superficial parotidectomy.J Oral Maxillofac Surg. 1994;52:1038-41.

6.  O'Brien CJ. Current management of benign parotid tumours-the role of limited superficial parotidectomy. Head Neck. 2003;25:946-52.
7.  Wang DZ, Liu SJ, Donoff RB, Guralnick W.A modified centripetal approach to parotidectomy. J Oral Maxillofac Surg. 1985;43:14-9.
8.  Frustenberg AC, McWhorter, BeahrsKidd H.A: Reconstruction of the FacialNerve, Arch of Otolaryngology. 1945;41:42-47.
9.  BarryO'Regan, Girish Bharadwaj. British Journal of Oral and Maxillofacial Surgery. 2011; 49:286-291.

10. Henney SE, Brown R, Phillips D. Eur Arch Otorhinolaryngol. 2010 Jan;267(1):131-5. Doi: 10.1007/s00405-009-0980-1.
11. Bron LP, O'Brien CJ. Facial nerve function after parotidectomy. Arch Otolaryngol Head Neck Surg., 1997.
12. David C Upton, Justin PMcNamar, Nadine PConnor, Paul MHarari, Gregory K Tig. Parotidectomy: Ten-year review of 237 cases at a single institution.2007;136(5):0-792.
13. Reza NouraeiSA, Yasmin Ismail, Mark S Ferguson, Neil RMcLean, Richard H Milner, Peter J Thomson*et al*. Analysis of Complications Following Surgical Treatment of Benign Parotid Disease. 2008;78(3):134-138.
14. AnjumK,RevingtonPJ,IrvineGH.SuperficialParotidectomy:antegrade compared with modified retrograde nerve dissections of facial nerve. Br J of Oral and Maxillofacial Surgery. 2008; 46:433-43.