



SENSORY NERVE DISTURBANCES FOLLOWING MAXILLOFACIAL TRAUMA -A PROSPECTIVE STUDY

Maxillofacial Surgery

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ABSTRACT

Aim: The study was designed to evaluate the incidence and duration of the recovery of post-traumatic and postoperative sensory disturbances with the help of standard neurosensory tests. And, to compare which nerve, site and age group is most likely to suffer from neurosensory disturbances.

Materials & methods: Neurosensory tests included pin-prick, blunt and two-point discrimination test. Sensory function was evaluated in 25 patients affected by maxillofacial trauma pre-operatively, 1st week, 2nd week and 3rd week post-operatively. Non-traumatized area was used as control and the responses of the two sides were compared.

Conclusion: The conventional clinical examination methods were quite significant according to the statistics provided. Around 84% of patients had altered sensation before the surgery showing that it is less likely paraesthesia develops later but in fact improves post-surgery. Most of the patients belonged to young age group, v3 being the most commonly involved secondary to mandibular fractures.

KEYWORDS

Maxillofacial trauma; Trigeminal nerve; Paraesthesia; Hypoesthesia

INTRODUCTION

Sensory nerve disturbance represents a troublesome sequelae of facial trauma causing a reduced quality of life. It may be caused by indirect injury of nerve, compression by soft tissue oedema, or direct nerve involvement within fracture with consequent dislocation, traction/compression. Peripheral anatomic injuries of nerve fibres are subdivided into neurapraxia, axonotmesis, and neurotmesis, as reported by Seddon. Impairments of facial sensibility can be permanent/temporary, partial/complete, and moderate/severe, depending on the type and degree of anatomic injury.¹

A knowledge of the incidence and extent of post-traumatic and postoperative sensory disturbances following surgical fracture repair is of significance for quality control.²

Neurosensory testing is designed to determine the degree of sensory disturbance, monitor sensory recovery, and to point out whether or not surgical intervention is indicated.³ It is divided into two basic categories based upon the specific receptors stimulated through cutaneous contact, mechanoreceptive and nociceptive. Mechanoreceptive testing is further divided into two-point discrimination, static light touch and brush directional stroke tests, and nociceptive testing as pin-prick and thermal discrimination tests. Two-point discrimination is designed for testing large, myelinated, slowly adapting, A alpha sensory nerve fibres. The sensations of static light touch believed to be selected for discriminating large, myelinated, quickly adapting, A alpha sensory nerve fibres. Pin-prick is specific for small, myelinated, A delta and C sensory nerve fibres; sharp/blunt for small, myelinated, A delta and C sensory nerve fibres (sharp) and large, myelinated, A alpha sensory nerve fibres (blunt).³

AIMS AND OBJECTIVE:

This prospective study evaluates the incidence and duration of the recovery of post-traumatic and postoperative sensory disturbances with the standard neurosensory tests conducted pre operatively, 1st week, 2nd week and 3rd week post-operatively. Also, to compare which nerve, site and age group is most likely to suffer from neurosensory disturbances.

MATERIAL AND METHODS:

The study was conducted in the Department of Oral and Maxillofacial Surgery, College Of Dental Sciences, Davangere. Consent for performing the study was obtained from the institutional ethical committee, and written consent from each volunteer after the nature of

the study had been fully explained. This prospective study was conducted on 25 patients with unilateral fractures over a period of the year between 2016-2018.

Inclusion criteria:

- All maxillofacial trauma patients.
- Male & female patients from age group 12 – 50 years.

Exclusion criteria:

- Patients with a history of psychiatric disorders.
- Patients with severe head injury and low GCS score at the time of admission.
- Patient with systemic conditions that alter the peripheral neural conduction.
- Patient with bilateral side affected is excluded.

Patients were segregated into zygomatic, maxillary and mandibular fractures and tested by two methods which includes sharp/blunt and two-point discrimination test. Sensory functions were evaluated pre-operatively, 1st week, 2nd week and 3rd week post-operatively.

The areas evaluated were those supplied by Trigeminal Nerve:

1. Forehead
2. Upper eyelid
3. Lower eyelid
4. Lateral surface of nose
5. Upper lip
6. Lower lip
7. Skin over cheek
8. Skin over chin
9. Tongue
10. Teeth

The patients were asked to close eyes and tests were carried out on normal side and then on the affected side. Non-traumatized area was used as control and the responses of the two sides were compared.

RESULTS:

Neurosensory evaluation was done with the objective examination methods. For pin prick test, Mann-Whitney U test was done at each time interval to check the difference between the affected and the unaffected side. The test showed that at each time interval the sensation on the affected side was significantly less ($p < 0.001$). The Friedman test was done to check the improvement of sensation from the pre-op

period to 3-weeks post-op and it showed significant improvement over time ($p < 0.001$). And Wilcoxon Signed rank test was done to check for individual differences.

The p values are as follows:

Pre-op vs 1st week ($p = 0.011^*$)

Pre-op vs 2nd week ($p = 0.002^*$)

Pre-op vs 3rd week ($p < 0.001^*$)

1st week vs 2nd week ($p = 0.058$)

1st week vs 3rd week ($p = 0.008^*$)

2nd week vs 3rd week ($p = 0.025^*$)

There was significant improvement at all time intervals except between 1st and 2nd week where the difference was not statistically significant. At each time interval, the sensations on the affected side were significantly less than the unaffected ($p < 0.001$) (Table 1).

Similarly, for two-point discrimination the Mann-Whitney U test showed that the affected side had significantly less sensation than the unaffected ($p < 0.001$). Friedman test showed significant improvement over time ($p = 0.001$). And Wilcoxon Signed rank test was done to check individual differences.

The p values are as follows:

Pre-op vs 1st week ($p = 0.317$)

Pre-op vs 2nd week ($p = 0.004^*$)

Pre-op vs 3rd week ($p = 0.001^*$)

1st week vs 2nd week ($p = 0.001^*$)

1st week vs 3rd week ($p < 0.001^*$)

2nd week vs 3rd week ($p = 0.102$)

The scores didn't significantly improve from the pre-operative period to first week initially (3.0 to 3.12) ($p = 0.317$). But thereafter, the improvement was significant from 1st week to 2nd ($p = 0.001$). There was also no significant difference between the 2nd and 3rd week ($p = 0.102$). However, the scores of the 3rd week were of much significance (Table 2).

Fisher's test was done at each time interval to check whether there was any difference between the affected and the unaffected side. Pre-operatively there was a difference which was significant ($p = 0.049$). But it wasn't statistically significant post-operatively at 1st week, 2nd week or 3rd week when checked with blunt test.

McNemar tests were done to check individual differences in the affected group to see improvement, if any.

The p-values are as follows:

Pre-op vs 1st week ($p = 1.000$)

Pre-op vs 2nd week ($p = 0.250$)

Pre-op vs 3rd week ($p = 0.125$)

1st week vs 2nd week ($p = 0.500$)

1st week vs 3rd week ($p < 0.250$)

2nd week vs 3rd week ($p = 1.000$)

The p-values above shows that the differences seen over time are not statistically significant. (Table 3).

Demographic Data

In this study 24 (96%) were males and 1 (4%) female with median age of 26yrs (Mean = 27.4 ± 6.62 yrs) with minimum age 17yrs and maximum age 43 years.

Characteristics of the Fractures

There were 10(40%) right sided cases and 15(60%) left-sided cases and 4 patients had mandibular body fracture, 1 patient had angle fracture, 12 patients had ZMC fracture, 8 patients parasymphysis fracture and 2 patients had associated condylar fractures.

Table 1 – Results Of Pinprick test

No. of Patients			Pre-op	1st week	2nd week	3rd week
	No pain (Numb)		0	0	0	0

Pin Prick Test	Affected Side (n=25)	Very Mild Pain (Almost Numb)	4	4	3	2
		Mild Pain (Reduced)	17	9	5	3
		Moderate Pain (Almost Normal)	4	12	17	19
		Normal	0	0	0	1
	Unaffected Side (n=25)	No pain (Numb)	0	0	0	0
		Very Mild Pain (Almost Numb)	0	0	0	0
		Mild Pain (Reduced)	0	1	1	1

Table 2 – Results Of Two Point Discrimination

No. of Patients			Pre-op	1 week	2 week	3 week
2 -Point Test	Affected Side (n=25)	>20mm (Numb)	1	0	0	0
		16 - 20mm (Almost Numb)	4	3	2	1
		11 – 15mm (Reduced)	14	16	6	5
		6 – 10mm (Almost Normal)	6	6	16	18
		<5mm (Normal)	0	0	1	1
		>20mm (Numb)	0	0	0	0
	Unaffected Side (n=25)	16 - 20mm (Almost Numb)	0	0	0	0
		>20mm (Numb)	0	0	0	0

Table 3 –Results Of Blunt Test

No. of Patients			Pre-op	1 week	2 week	3 week
Blunt Test	Affected Side (n=25)	Can Perceive	18	19	21	22
		Can't Perceive	7	6	4	3
	Unaffected Side (n=25)	Can Perceive	24	24	24	24
		Can't Perceive	1	1	1	1
p-values (Affected v/s Unaffected)			0.049*	0.098	0.349	0.609

DISCUSSION

The face, and in particular the oral and perioral regions has the highest density of peripheral receptors. It is difficult to tolerate neurological disturbances in these areas compared to other parts of the body.³

Injury to the maxillary and mandibular branches of the trigeminal nerve can result in altered sensation presenting as hypoesthesia, paraesthesia, dysesthesia and hyperalgesia.⁷

Information provided in the literature on the incidence of sensory disturbances following surgical treatment of mandibular and midfacial fractures is not consistent. The incidence of temporary post-operative sensory disturbances affecting the IAN following MF is reported to be between 18% and 91% (*Iizuka and Linqvist*, 1991, 1992; *Tuovinen et al.*, 1994; *Renton and Wiesenfeld*, 1996; *Schultze-Mosgau et al.*, 1996). Figures for persistent neurological dysfunction of the IAN range from 2% to 47% (*Tuovinen et al.*, 1994; *Reinert et al.*, 1996).

The incidence of postoperative sensory disturbances of the ION after surgical repair of MFF reported in the literature range from 35% to 74% for temporary dysfunction, and 7% to 49% for permanent neurological deficits (*Souyris et al.*, 1989; *Schindelbauer*, 1990; *Taicher et al.*, 1993; *Bonkowski et al.*, 1998).²

In the present study, 84% participants had altered sensation before the surgery showing that it is less likely that paraesthesia develops later but in fact improves after the surgery. Of note is that the discomfort was usually mild to moderate and resolved by 3 weeks (52%).

The objective assessment is desirable as it pertains to the monitoring of return of function after impairment rather than asking a patient to subjectively report neuropathic changes. Many refined techniques for testing sensation have been developed for research purposes, but from practical point of view there is need to use methods that are readily available in clinical practice.⁴

In our study, the scores didn't significantly improve from the pre-operative period to the first week initially but thereafter, the improvement was significant. Using blunt test, pre-operatively there was difference, but it was not statistically significant post-operatively and didn't reliably distinguish between affected and unaffected side and failed to show any improvement over time.

Landau found a mildly injured nerve fibre could conduct up about 5 days after injury until it suffered the effects of inflammation and these patients should have a better prognosis, their damage being limited to neurapraxia.⁵

These simple tests can be completed within a few minutes and it's appropriate for use in a busy outpatient clinic. Regular testing of patients will enable the examiner to develop a rapid consistent technique and aid determination of whether or not recovery of sensation is progressing satisfactorily.⁶

CONCLUSION:

The conventional clinical examination methods were quite significant according to the statistics provided. There was a significant difference between the affected and unaffected side even after 3-weeks post-op. The blunt test was the only exclusion, as it didn't distinguish between both sides, it is not recommended as a reliable tool for measuring neurosensory deficits. Around 84% of patients had altered sensation before the surgery showing that it is less likely paraesthesia develops later but in fact improves post-surgery. Most of the patients belonged to young age group, v3 being most commonly involved secondary to mandibular fractures.

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