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Research Article

Comparative Evaluation of Post-Operative Facial Nerve Injury in Conventional 45º Incision V/S Modified 90º Incision in Al-Kayat Bramley and Hemi-Coronal Approach

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ABSTRACT
Introduction: The facial nerve is considered the "Queen of The Face" as it innervates the muscles of facial expression. Al-Kayat and Bramley a modified preauricular approach to TMJ and malar arch in an effort to protect temporal and zygomatic branches. They insisted upon placing a 45^0 incision in superficial temporalis fascia. However temporal and zygomatic branches involvement were still noted following Al-Kayat Bramley approach. Hence, we believed a necessity to revisit this conventional 45^0 incision.
Methods: The present study was meticulously planned and executed, involving patient who sought consultation at outpatient department. The sample consisted of 34 patients operated by the same surgical team using Al-Kayat Bramley and Hemi-coronal approach. Patients were divided randomly into two groups. Group 1 included patients operated using the conventional 45^0 incision and group 2 included patients operated using the modified 90^0 incision. All patients were examined using the House Brackmann Facial Nerve Grading System scale at regular intervals to assess the degree of improvement or deterioration.
Results: The incidence of temporal and zygomatic nerve injuries was less in modified 90^0 incisions than conventional 45^0 incision
Conclusion: Facial nerve impairment was shown to be of a temporary nature. This study shows that the modified 90º incision is associated with reduced incidence of facial nerve injury post operatively when compared to conventional 45^0 incision.

Keywords: Al-Kayat Bramley Approach, Nerve Injury, Temporalis Fascia, Facial Nerve Injury, Hemicoronal Approach.

INTRODUCTION

The facial nerve is considered the *"Queen of The Face"* as it innervates the muscles of facial expression. It contains the motor, sensory, and parasympathetic (secretomotor) nerve fibres, which provide innervations to head and neck region. Anatomic variations and multiple innervation patterns of the peripheral branches render facial nerve to increased risk of injury during various craniomaxillofacial surgical procedures. The incidence of facial nerve injury following various surgical procedures in the maxillofacial region ranges from 0-48%. (1)
Incidence of facial nerve injury following TMJ surgeries ranges from 1-32%.(2) Any injury to facial nerve or its branches can result in facial muscle weakness either temporary or permanent which can have serious consequences on patient's emotional and psychosocial well-being. The temporal and zygomatic branches are especially at-risk during surgery of TMJ and zygomatic complex due to their superficial course. Al-Kayat and Bramley described in their classic article a modified preauricular approach to TMJ and malar arch in an effort to protect temporal and zygomatic branches. They insisted upon placing a 45^0 incision in superficial temporalis fascia starting at the root of the malar arch and running upwards and forward parallel to the course of the nerve. (3)
However temporal and zygomatic branches involvement were still noted following Al-Kayat Bramley approach. Hence, we believed it was

necessary to revisit this conventional 45^0 incision and surgical anatomy of temporal region. Detailed knowledge of the nerve branches' course was gained from the existing literature [4]. Based on this we were able to find a safety zone within which placing a 90^0 vertical incision decreased the risk of nerve injury.

Based on this rationale we modified the conventional 45^0 incision into a 90^0 incision in some of our patients to evaluate the incidence of postoperative facial nerve injury. The aim of this study is to compare the incidence of post-operative facial nerve injury in patients operated using Al-Kayat Bramley and Hemi-coronal approach with conventional 45º incision v/s modified 90º incision.

MATERIALS AND METHOD

The present study was conducted from June 2025 to January 2026. The sample consisted of 34 patients, 20 male and 14 female who were operated by the same surgical team to reduce bias using Al-Kayat Bramley and Hemi-coronal approach for TMJ ankylosis and zygomatic complex fractures. Patients were divided randomly into two groups. Group 1 included patients operated using the conventional 45^0 incision and group 2 included patients operated using the modified 90^0 incision. (Table 1) (Fig 1,2) The same medical and physiotherapeutic protocol was followed for patients in both groups.

Group 1 Surgical Technique

A question mark-shaped skin incision was placed beginning about a pinna's length away from the ear, antero-superiorly just within the hairline and curving backwards and downwards well posterior of the main branches of the temporal vessels till it meets the upper attachment of the ear after which it was continued as a standard preauricular incision. The temporal incision was carried through the skin and superficial fascia to the level of the temporal fascia.

Blunt dissection in this plane was carried downwards to a point about 2 cm above the malar arch where the temporal fascia splits. Starting at the root of the malar arch, an incision running at 45° upwards and forwards till the posterior border of the frontal process of the malar bone was made through the superficial layer of the temporal fascia.

The periosteum of the malar arch was incised and turned forward as one flap with the outer layer of temporal fascia, superficial fascia containing the nerves and skin. Proceeding downwards from the lower border of the arch and articular fossa, the tissues lateral to the joint capsule were dissected and retracted and condyle was exposed.

Group 2 Surgical Technique

The same surgical steps as mentioned above was followed. However, after elevation of temporoparietal fascia instead of 45^0 incision a 90^0 incision was placed in the superficial temporalis fascia 6mm from the anterior border of external auditory canal. The length of the incision is limited superiorly to within 2cm from the upper border of zygomatic arch and inferiorly up-to 1cm below the lowest concavity of bony external auditory canal. (Fig 3,4,5)

All patients were examined using the House Brackmann Facial Nerve Grading System scale [5] at 24 hours, 2 weeks, 2 months and at 6 months (Fig 6) to assess the degree of improvement or deterioration. (Table 2,3,4). Facial nerve function of all patients was evaluated by the same set of examiners preoperatively, postoperatively, and during the follow-up period in both the groups. (Table5,6,7)

RESULT

Out of the 34 patients selected, 16 patients were diagnosed with temporomandibular joint ankylosis and 18 patients with zygomatic complex fractures. A total of 34 surgical approaches were carried out with Al-Kayat and Bramley approach and Hemi-coronal approach in which conventional 45^0 incision was given in 17 patients and modified 90º incision in 17 patients.

In a total of 34 patients, 15 (44.11%) had facial nerve injury following surgery. Out of which 6 (35.3%) were seen in modified 90º incision and 9 (52.9%) in conventional 45º incision. Though in modified 90º incision the proportion of the facial nerve injury was less than the conventional 45º incision, however the difference was not found to be significant (p=0.300). (Table 8) (Fig 8)

Among the cases, where facial nerve injury was present, both temporal & zygomatic branch were involved in 88.9% cases with conventional 45º incision whereas only 20% cases had injury of both the branches in modified90º incision. Therefore, a significant difference was found between the two incisions in relation to the number of branches involved (p = 0.010). (Table 9) (Fig 9)

Initially at 24 hr,

Among patients operated with conventional 45º incision, cases without facial nerve injury

(grade I) were present in47.1%, 29.4% with grade II and 23.5% with grade III nerve injury
Among patients operated with modified 90º incision,64.7% cases were without nerve injury (grade I), 35.3% with grade II and no cases with grade III nerve injury.
No significant difference was found in proportion of recovery of facial nerve injury between the two incision types (p=0.102).
At 2 weeks,
Among patients operated with conventional 45º incision, cases without facial nerve injury (grade I) increased to 52.9%,20% improvement seen incases with grade II and no improvement seen among grade III nerve injury patients.
Among patients operated with modified 90º incision, cases without facial nerve injury (grade I) increased to 88.2% and 66.5% improvement seen in cases with grade II.
The significant difference was found in proportion of recovery of facial nerve injury between the two incision types (p=0.046).
At 2 months,
Among patients operated with conventional 45º incision,cases without facial nerve injury (grade I) increased to 76.5%, no improvement seen in cases with grade II and 100% improvement with grade III nerve injury.
100% recovery seen in patients operated with modified 90º incision.
The significant difference was found in proportion of recovery of facial nerve injury between the two incision types (p=0.033).
At 6 months,
Among patients operated with conventional 45º incision, cases without facial nerve injury (grade I) increased to 82.4%,40% improvement seen in cases with grade II and 100% improvement with grade III nerve injury.
100% recovery seen in patients operated with modified 90º incision.
No significant difference was found in proportion of recovery of facial nerve injury between the two incision types (p=0.070). (Table 10) (Fig 10)

DISCUSSION

The anatomical course of temporal and zygomatic branches of facial nerve marks these nerves at risk during surgeries for temporomandibular joint ankylosis and zygomatic complex fractures. [6] These nerves lie within the tough connective tissue representing the fusion of the three layers, namely, superficial fascia, temporoparietal fascia, and superficial temporalis fascia. Adil Al-Kayat and Paul Bramley proposed a safety technique to avoid violation of this dangerous area. They were convinced that by entering the pocket between superficial and deep temporalis fascia the nerves can be safely lifted up in the skin-fasciae flap. To enter this pocket they proposed a 45^0 incision which according to them was parallel to the nerve course thus avoiding any inadvertent nerve injury. A modification of this conventional approach, namely deep subfascial approach has been suggested to offer further protection to nerve by increasing thickness of the skin-fasciae flap. [7] How-ever these authors also followed the conventional 45^0 incision. Nerve injury was still a major concern during these surgeries even with experienced hands.
By revisiting the existing literature on anatomical course of facial nerve and its branches we were able to identify a zone of safety within the dangerous area. By taking advantage of this safety zone (Fig 7), we were able to modify this conventional 45 incision into 90 incision. The temporal branch lies on average 2.0 cm from the anterior concavity of the external auditory canal. In individual cases, it lies as near as 0.8 cm or as far anteriorly as 3.5 cm. [3] So, by placing an incision within 8mm from external auditory canal we found a possibility of reducing temporal branch injury. The main trunk of facial nerve divides into temporo-facial and cervicofacial divisions within 1.5 cm and 2.8 cm below the lowest concavity of the bony external auditory canal. The area within 1.5cm from the lowest concavity of the bony external auditory canal maybe considered safe. So, we extended our vertical incision up to 1 cm below the lowest concavity of bony external auditory canal.
At approximately 2cm above the zygomatic arch the temporalis fascia splits into superficial and deep temporal fascia. [8] We limited our incision superiorly to 2cm from the superior border of zygomatic arch as further extension may result in violation of surgical plane.
As the initial skin incision made through the skin, subcutaneous tissue and temporoparietal fascia remains same for both the conventional technique and our modified technique and auriculotemporal nerve along with superficial temporal vessels are retracted forward within the flap there is no increased risk of damaging auriculotemporal nerve in our technique. It lies in the raised flap consisting of skin, subcutaneous tissue and temporoparietal fascia. Hence by placing a 90^0 incision in the superficial temporalis fascia layer will not

usually place this nerve at risk. Additionally, by keeping our dissection close to the cartilaginous external auditory canal we can further reduce the risk of auriculotemporal nerve injury.

Over-all our study results showed a decreased incidence (35.3%) of facial nerve injury in modified 90^0 incision group compared to conventional group (52.9%). How-ever this difference in incidence was not statistically significant (p=0.300). The number of patients with both temporal and zygomatic branch injury was higher in conventional group when compared to modified group and this difference was found to be statistically significant (p=0.010)

Furthermore,the analysis of follow-up results showed a significant difference in the nerve recovery rate between the two groups. At 2 months follow-up in modified group complete nerve recovery (100%) was noted.

Our study results showed a lower incidence of temporal and zygomatic nerve injuries in modified 90^0 incision group compared to conventional 45^0 incision group. How-ever our study also has many limitations like small sample size and except for nerve injury other parameters like area of surgical exposure obtained with the two incisions was not compared, although the surgical exposure was limited with modified 90^0 incision. Further multicentric studies involving a bigger sample size are needed to prove the anatomical safety of our 90^0 incisions. Also, this study employed a subjective rather than objective method for nerve injury assessment.

CONCLUSION

In short, the frequency of facial nerve injury was related to the diagnosis of the temporomandibular pathology and surgical procedures.[9] Facial nerve impairment was shown to be of a temporary nature.[10] Nerve injury to both temporal and zygomatic branch is noted in the conventional 45º incision and nerve injury (if present) of only temporal branch is noted in modified 90º incision. This study shows that the modified 90º incision is associated with reduced incidence of facial nerve injury post operatively when compared to conventional 45^0 incision. Further multicentric studies involving a bigger sample size are needed to prove the anatomical safety of our 90^0 incision.

Author Contributions

Dr Deepika Kumari Jain: Conceptualization, Data curation, Literature search, Methodology, Project administration, Writing – original draft

Dr Kaushal Bijlani: Investigation, Methodology, Project administration, Resources, Supervision, Writing – review & editing.

Dr Nirmal Kumar Chouraisia: Investigation, Methodology, Project administration, Writing – review & editing.

Dr Geeta Singh: Conceptualization, Data curation, Literature search, Methodology, Project administration, Writing – original draft

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Figure 1 showing pre op clinical photograph of patient with left TMJ Ankylosis

Figure 2 showing pre op orthopantomogram (OPG)

Figure 3 intra op photograph showing incision marking

Figure 4 intra op photograph showing landmarks of modified 90^0 incision Blue pin – Superior extent, Yellow pin – Anterio-posterior extent, White pin – Inferior extent

Figure 5 intra op photograph showing completed modified 90^0 incision

Figure 6 showing post op clinical photograph at 24 hours, 2 weeks, 2 months showing no evidence of nerve injury, 6 months showing no evidence of nerve injury.

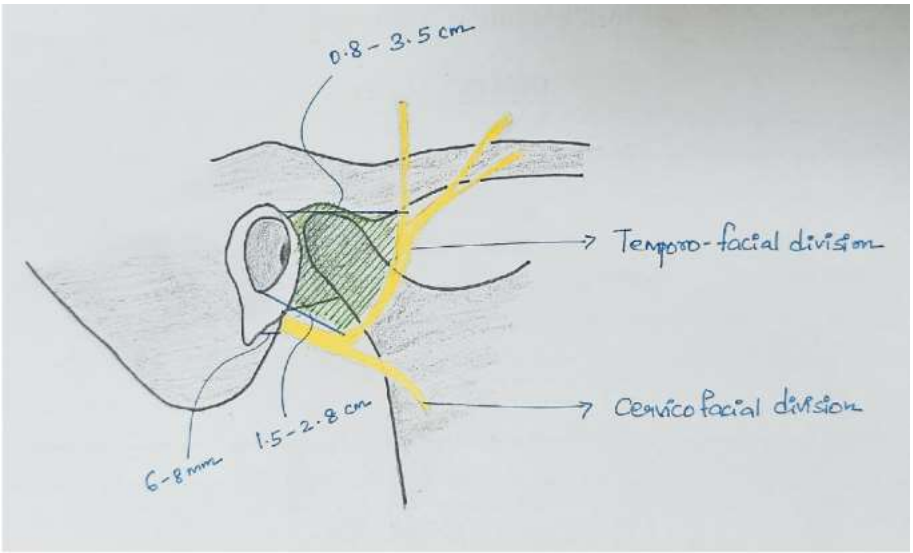

Figure 7 showing hand drawn picture showing facial nerve course: shaded portion represents the safe zone within which modified 90^0 incision was placed.

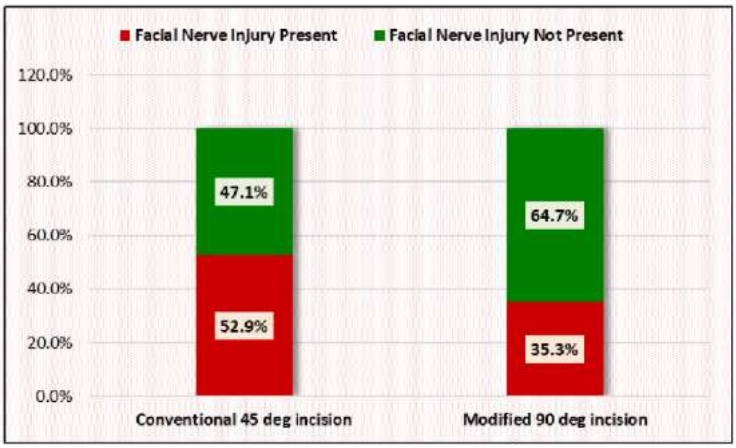

Figure 8 showing comparison of Facial Nerve Injury by Incision

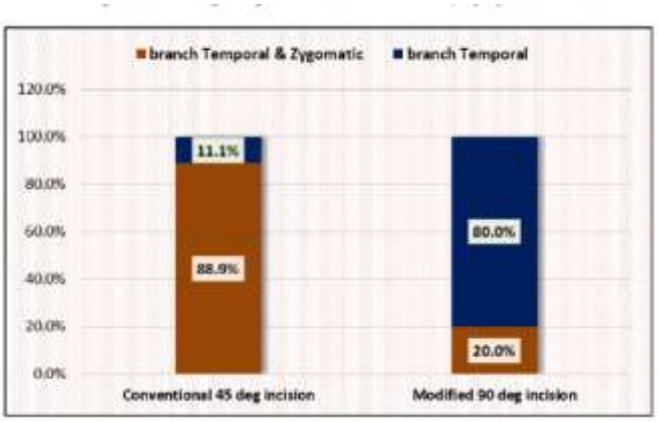

Figure 9showing comparison of Branches Involved in Facial Nerve Injury by Incision

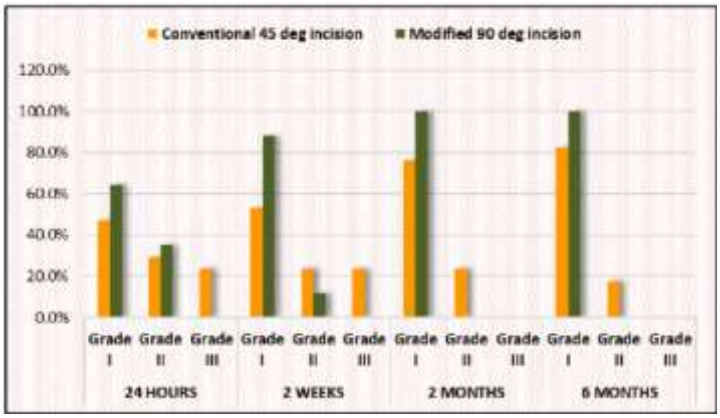

Figure 10 showing comparison of Facial Nerve Status in Follow up by Incision

Table 1 Showing Distribution of Patients into Various Surgical Approaches

DIAGNOSIS	SURGICAL APPROACH			
	Conventional 45^0 incision		Modified 90^0 incision	
	Al-kayat Bramley	Hemi-coronal	Al-kayat Bramley	Hemi-coronal
TMJ Ankylosis	5	2	6	3
Zygomatic Complex fractures	6	4	4	4
Total	17		17	

Table 2 Assessment of Motor Function of Facial Nerve Branches:

FACIAL NERVE BRANCH	FUNCTION ASSESSMENT
Temporal branch	Ability to raise the eyebrow or wrinkle the forehead
Zygomatic branch	Ability to close the eyelid completely

Table 3 House-Brackmann Facial Nerve Grading System

GRADE	DESCRIPTION	CHARACTERISTICS
I	Normal	Normal facial function in all areas.
II	Mild dysfunction	Gross: Slight weakness noticeable on close inspection; may have very slight synkinesis. At rest: Normal symmetry and tone. Motion: Forehead: moderate to good function Eye: complete closure with minimum effort Mouth: slight asymmetry
III	Moderate dysfunction	Gross: Obvious but not disfiguring difference between two sides; noticeable but not severe synkinesis, contracture and/or hemifacial spasm.

		At rest: Normal symmetry and tone. Motion: Forehead: slight to moderate movement Eye: complete closure with effort Mouth: slightly weak with maximum effort
IV	Moderately severe dysfunction	Gross: Obvious weakness and/or disfiguring asymmetry. At rest: Normal symmetry and tone Motion: Forehead: none Eye: incomplete closure Mouth: asymmetric with maximum effort
V	Severe dysfunction	Gross: Only barely perceptible motion. At rest: Asymmetry Motion: Forehead: none Eye: incomplete closure Mouth: slight movement
VI	Total Paralysis	No movement

Table 4 Facial Nerve Grading System

GRADE	DESCRIPTION	MEASUREMENT	FUNCTION (%)	ESTIMATED FUNCTION (%)
I	Normal	8/8	100	100
II	Mild	7/8	76 – 99	80
III	Moderate	5/8 – 6/8	51 – 75	60
IV	Moderately severe	3/8 – 4/8	26 – 50	40
V	Severe	1/8 – 2/8	1 – 25	20
VI	Total	0/8	0	0

Table 5 Conventional 45º Incision Nerve Injury Follow Up

CASE	24 HOURS	2 WEEKS	2 MONTHS	6 MONTHS
1	Grade III	Grade III	Grade II	Grade I
2	Grade III	Grade III	Grade II	Grade II
3	Grade II	Grade II	Grade I	Grade I
4	Grade II	Grade II	Grade I	Grade I
5	Grade II	Grade I	Grade I	Grade I
6	Grade III	Grade III	Grade II	Grade II
7	Grade II	Grade II	Grade I	Grade I
8	Grade III	Grade III	Grade II	Grade II
9	Grade II	Grade II	Grade I	Grade I

Table 6 Modified 90º Incision Nerve Injury Follow Up

CASE	24 HOURS	2 WEEKS	2 MONTHS	6 MONTHS
1	Grade II	Grade II	Grade I	Grade I
2	Grade II	Grade I	Grade I	Grade I
3	Grade II	Grade I	Grade I	Grade I
4	Grade II	Grade I	Grade I	Grade I
5	Grade II	Grade II	Grade I	Grade I
6	Grade II	Grade I	Grade I	Grade I

Table 7 Showing Demographic Details, Diagnosis, Approaches Used and Branches Involved In The Study Population

SL NO	AGE/SEX	DIAGNOSIS	APPROACH	INCISION	BRANCHES AFFECTED
1.	16Yr/M	Left TMJ Ankylosis	Al-kayat Bramley	Conventional 45^0 incision	Temporal & Zygomatic

2.	24Yr/F	Right TMJ Ankylosis	Hemi-coronal	Conventional 45^0 incision	-
3.	21Yr/M	Zygomatic Complex fractures	Al-kayat Bramley	Modified 90^0 incision	Temporal
4.	25Yr/M	Right TMJ Ankylosis	Al-kayat Bramley	Conventional 45^0 incision	Temporal & Zygomatic
5.	37Yr/F	Zygomatic Complex fractures	Hemi-coronal	Conventional 45^0 incision	Temporal & Zygomatic
6.	17Yr/F	Left TMJ Ankylosis	Al-kayat Bramley	Modified 90^0 incision	-
7.	40Yr/M	Zygomatic Complex fractures	Al-kayat Bramley	Modified 90^0 incision	-
8.	36Yr/M	Zygomatic Complex fractures	Hemi-coronal	Conventional 45^0 incision	Temporal & Zygomatic
9.	27Yr/M	Zygomatic Complex fractures	Al-kayat Bramley	Modified 90^0 incision	-
10.	14Yr/F	Right TMJ Ankylosis	Al-kayat Bramley	Modified 90^0 incision	-
11.	22Yr/M	Left TMJ Ankylosis	Hemi-coronal	Modified 90^0 incision	-
12.	18Yr/M	Zygomatic Complex fractures	Al-kayat Bramley	Conventional 45^0 incision	Temporal & Zygomatic
13.	50Yr/M	Zygomatic Complex fractures	Al-kayat Bramley	Conventional 45^0 incision	Temporal
14.	15Yr/M	Right TMJ Ankylosis	Hemi-coronal	Modified 90^0 incision	-
15.	23Yr/F	Right TMJ Ankylosis	Al-kayat Bramley	Modified 90^0 incision	Temporal
16.	42Yr/M	Zygomatic Complex fractures	Al-kayat Bramley	Conventional 45^0 incision	-
17.	26Yr/M	Left TMJ Ankylosis	Al-kayat Bramley	Conventional 45^0 incision	-
18.	33Yr/F	Zygomatic Complex fractures	Al-kayat Bramley	Conventional 45^0 incision	-
19.	11Yr/M	Right TMJ Ankylosis	Al-kayat Bramley	Conventional 45^0 incision	-
20.	28Yr/M	Zygomatic Complex fractures	Hemi-coronal	Modified 90^0 incision	Temporal
21.	46Yr/M	Zygomatic Complex fractures	Hemi-coronal	Modified 90^0 incision	-
22.	32Yr/F	Zygomatic Complex fractures	Hemi-coronal	Modified 90^0 incision	-
23.	13Yr/M	Left TMJ Ankylosis	Al-kayat Bramley	Modified 90^0 incision	Temporal
24.	53Yr/M	Zygomatic Complex fractures	Hemi-coronal	Modified 90^0 incision	-
25.	22Yr/M	Right TMJ Ankylosis	Hemi-coronal	Conventional 45^0 incision	Temporal & Zygomatic
26.	26Yr/F	Zygomatic Complex fractures	Al-kayat Bramley	Conventional 45^0 incision	Temporal & Zygomatic
27.	30Yr/M	Zygomatic Complex fractures	Al-kayat Bramley	Modified 90^0 incision	-
28.	28Yr/M	Left TMJ Ankylosis	Hemi-coronal	Modified 90^0 incision	-
29.	13Yr/F	Right TMJ Ankylosis	Al-kayat Bramley	Modified 90^0 incision	Temporal & Zygomatic

30.	34Yr/M	Zygomatic Complex fractures	Hemi-coronal	Conventional 45^0 incision	-
31.	31Yr/F	Zygomatic Complex fractures	Al-kayat Bramley	Conventional 45^0 incision	-
32.	27Yr/M	Right TMJ Ankylosis	Al-kayat Bramley	Conventional 45^0 incision	Temporal & Zygomatic
33.	22Yr/F	Left TMJ Ankylosis	Al-kayat Bramley	Modified 90^0 incision	Temporal
34.	44Yr/M	Zygomatic Complex fractures	Hemi-coronal	Conventional 45^0 incision	-

Table 8 Showing Comparison Of Facial Nerve Injury By Incision

Incision	**Facial Nerve Injury**				**chi sq**	**p-value**
	Present		**Not Present**			
	No.	**%**	**No.**	**%**		
Conventional 45º incision	9	52.9%	8	47.1%	1.07	0.300
Modified 90º incision	6	35.3%	11	64.7%		
Total	15	44.1%	19	55.9%		

Table 9 Showing Comparison Of Branches Involved In Facial Nerve Injury By Incision

Incision	**Branch**				**chi sq**	**p-value**
	Temporal & Zygomatic		**Temporal**			
	No.	**%**	**No.**	**%**		
Conventional 45º incision	8	88.9%	1	11.1%	6.64	**0.010**
Modified 90º incision	1	20.0%	4	80.0%		
Total	9	64.3%	5	35.7%		

Table 10 Showing Comparison Of Facial Nerve Status In Follow Up By Incision

Facial Nerve Status		**Incision**				**chi sq**	**p-value**
		Conventional 45º incision		**Modified 90º incision**			
		No.	**%**	**No.**	**%**		
24 HOURS	Grade I	8	47.1%	11	64.7%	4.57	0.102
	Grade II	5	29.4%	6	35.3%		
	Grade III	4	23.5%	0	0.0%		
2 WEEKS	Grade I	9	52.9%	15	88.2%	6.17	**0.046**
	Grade II	4	23.5%	2	11.8%		
	Grade III	4	23.5%	0	0.0%		
2 MONTHS	Grade I	13	76.5%	17	100.0%	4.53	**0.033**
	Grade II	4	23.5%	0	0.0%		
	Grade III	0	0.0%	0	0.0%		
6 MONTHS	Grade I	14	82.4%	17	100.0%	3.29	0.070
	Grade II	3	17.6%	0	0.0%		
	Grade III	0	0.0%	0	0.0%		