A Comparative Evaluation of Surgical, Electrosurgery and Diode Laser in the Management of Maxillofacial Nevus

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Abstract

Purpose To compare the post-operative wound healing of patients treated for excision of the nevus/mole from maxillofacial region with surgical, electrosurgery and diode laser.

Materials and Methods Forty-five clinically confirmed cases of benign nevus were included in the study and randomly divided into three groups according to the technique used for excision, i.e. Group A—surgical excision, Group B—diode laser and Group C—electrosurgery. Post-operative wound evaluation was done using Stony Brook scar evaluation scale on post-operative photographs taken on days 7, 21 and 90 (3 months).

Results Statistically, there was no significant difference between the three techniques on post-operative day 90. Clinically, hypopigmentation was noted with diode laser and electrosurgical excision of benign nevus.

Conclusion Since all three techniques yielded statistically comparable results, the patients can be given a choice of technique to undergo surgery. Surgical excision being the most cost effective and nil post-operative hypopigmentation may be the treatment of choice for majority of the patients.

Keywords Mole · Nevus · Surgical excision · Laser · Electrosurgery

Introduction

Over the last few years, there has been an increase in the life expectancy of an individual and irrespective of age, every person desires to appear more appealing. Human face is an organ portraying external beauty, and this facial beauty is a combination of qualities, such as form, proportion, flawless, well-toned and supple skin, etc., that charms the gaze. The expressive function of the face has social and psychological importance [1–5].

The aesthetics of face can be affected by congenital and acquired lesions. Congenital lesions include moles (melanocytic nevus), melanomas, hemangiomas, etc., and acquired lesions include melasma, post-traumatic, post-surgical and acne scars, etc. Mole (congenital melanocytic nevus) is one of the common lesions affecting the perception of facial aesthetics. Along with the size, shape and colour of the mole, even the position of a mole is a deciding factor with regard to facial beauty. A small mole just above the angle of mouth on the upper lip is said to be the perfect beauty spot. However, the same spot on the tip of nose may become an eyesore.

Individuals are keen on removal of these mole/nevi for various reasons. Poor aesthetic appearance remains the main reason behind seeking a mole removal [6]. Some nevi may need to be excised and biopsied if they clinically show features of malignant conversion. Apart from this, there are many patients who live with unaesthetic bothersome lesions, unaware of the fact that scar-free or minimal scar treatment modalities are available [6, 7].

Nevus (or nevus, plural-nevi, from nevus, Latin for “birthmark”) is the medical term for sharply circumscribed and chronic lesions of the skin or mucosa. They may be pigmented and non-pigmented tumours of the skin that contain nevus cells and are virtually present in all adults.

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These can be elevated, flat or pedunculated, smooth or papillomatous, hair bearing or non-hair bearing. A combination of these characteristics is referred to as compound nevi. The number of nevi in young adults varies from approximately 15 to 40, which decreases markedly over the age of 50 years [8].

There are various methods of treating benign lesions using surgical excision, electrosurgery, lasers, dermatome shaving, curettage, dermabrasion, chemical peels, ablative lasers, pigment-specific lasers, liquid nitrogen (cryotherapy) and no treatment (observation) [9]. The location of the nevus cell clusters also dictates the treatment modality for their removal.

It is generally accepted that all nevi should be submitted for histological examination for medicolegal reasons. In a recent study, 2.3% of clinically diagnosed benign nevi were microscopically diagnosed as malignant tumours, either melanomas or basal or squamous cell carcinomas [10–12].

Surgical excision is commonly used treatment modality for congenital melanocytic nevus (CMN) as it removes more nevus cells as compared to others. It might also reduce the incidence of malignant melanoma (MM) and improves cosmetic appearance for many small to medium CMN and possibly some giant congenital melanocytic nevi (GCMN). Few disadvantages like re-pigmentation or occurrence of new satellite nevi are observed after treating larger nevi.

Chemical peels, cryotherapy [12–16] and electrosurgery have obtained good cosmetic outcome but cryotherapy and electrosurgery show few disadvantages causing hypopigmentation of the treated skin and increasing the risk of malignant transformation.

Ablative lasers and pigment-specific lasers have cosmetically similar results and can be used in combination with each other. Pigment-specific lasers precisely targets melanosomes and melanocytes, which improve the cosmetic outcome with less surgery-related adverse outcomes. But risk of malignant transformation is circumstantial, with few studies showing no malignant transformation.

Sufficient literature exists regarding the various available treatment modalities for excision of melanocytic nevus, but none of the studies have compared the results of the different techniques. Hence, the purpose of this study was to clinically compare the post-operative wound healing treated with surgical, electrosurgery and diode laser for excision of the nevus/mole from maxillofacial region with respect to width, height, colour, hatch marks and overall appearance.

Materials and Methods

Study Design

This is a prospective randomized study consisting 45 cases of clinically benign nevus in maxillofacial region.

Source of Data

The study was conducted in Department of Oral and Maxillofacial Surgery of our institute after clearance from Institutional Ethical Committee. The sample represents the outpatient department of the institute and reference from various peripheral centres.

Forty-five patients (15 in each group according to the technique used) with clinically benign nevus in maxillofacial region irrespective of age and gender within the time period of October 2014 to October 2016 were included in the study. Subjects willing to participate in the study and willing to give informed written consent for the use of their photographs were included. Medically compromised individuals, patient having haemangioma, arteriovenous malformations, bleeding and clotting disorders were excluded from the study.

Pre-operative Preparation

Pre-operatively, all the participants were subjected to routine blood investigations (Hb, BT, CT and BSL). Patients were not given any pre-operative antimicrobial drugs that might influence healing.

Participants were counselled for the procedure, informed and explained about the complications of the procedure selected for the participants and about the local anaesthesia. Informed written consent was taken.

Participants were then divided randomly into three groups according to the treatment for excision of benign nevus and were operated by same experienced oral and maxillofacial surgeon.

Procedure

All the three procedures were performed under complete aseptic conditions and precautions. The operative site was scrubbed and painted. With adrenaline 2% lignocaine was injected beneath the lesion. Local anaesthesia was allowed to act for about 10 min.

1. Group A surgical excision

No. 15 BP blade was used to make fusiform incision around the lesion. The lesion was excised in wedge form and preserved for biopsy. The wound was closed using 3–0

Mersilk or 4–0 Ethilon with interrupted sutures if required. Haemostasis was achieved.

2. Group B diode laser excision

Laser unit

- 1) Model—Photon
Wavelength—810 nm
Output power—0.1–3.0 W
Input—DC 3.4 V
- 2) Model—Photon
Wavelength—980 nm
Output power—0.1–10.0 W
Input—DC 7.4 V

The lesion was excised using a suitable power ranged between 0.1 and 3.0 W and wavelength of 810 nm. The lesion was excised in circular fashion from centre to periphery if the lesion was small. And if the diameter of lesion was more than 5–10 mm, excision was started from periphery to centre and beneath the lesion in wedge form. Haemostasis was achieved.

3. Group C electrosurgical excision

Electrosurgical Unit

Low-frequency electrocautery system—Bonart electro-surgery unit, ART-E1

Power supply—115 V $\pm$ 5%—50–60 Hz 276 VA
230 V $\pm$ 5%—50–60 Hz 276 VA
Output power—maximum 50 W
(400 Ω load)
Frequency—1.5–1.7 MHz $\pm$ 5%

An earthing electrode was kept in contact with the skin of the patient. A single straight or loop electrode was used to excise the lesion. The lesion was excised in same fashion as stated for laser. Haemostasis was achieved. Specimens more than 5 mm diameter were preserved for biopsy.

After the Procedure

Wound dressing with soframycin ointment was given to protect the surface of wound and to prevent bacterial and viral contamination of healing wound. Post-operative instructions were given to the patients, and they were informed that oedema, erythema and crusting are normal sequelae to excision. Patients were also advised application of moisturizer with vitamins A, C and E and sunscreen lotion (SPF 30 or greater) to prevent sun damage to skin.

Patients were recalled for follow-up on 7th day, 21th day and 90th day (3rd month) post-operatively for assessment of healing and for extraoral photographs. All the

photographs were recorded by same person using same device.

Analysis of Data

The photographic data of each patient were printed on photographic sheet. Four photographs of each patient were presented on photographic sheet, i.e. pre-operative and post-operative days 7, 21 and 90 (3rd month).

All the photographs of total 45 patients were mixed for randomization before evaluation and numbered from 1 to 45. Stony Brook scar evaluation scale (Table 1) [17] was used to evaluate each post-operative photograph. The evaluation was done by three evaluators, i.e. dermatologist, dental surgeon and layman.

Statistical Analysis

The data were compiled using Microsoft Excel spreadsheet and subjected to statistical analysis using Statistical Package of Social Sciences (SPSS) version 20. Shapiro–Wilk’s test was done to determine normality of the data. Data were not found to be normally distributed; thus, nonparametric tests were done. Kruskal–Wallis ANOVA was done to determine whether there was any statistically significant difference in the mean scar evaluation scale score when the scars resulting after three different treatments were analysed. Multiple pairwise comparisons were done to determine which two groups showed a statistically significant difference.

Results

The present study included 45 clinically confirmed benign melanocytic nevus patients ($n = 45$). Age and sex distribution of the study population is given in Table 2.

There were a total of 15 patients in each group. The mean score (standard deviation) on Stony Brook scar evaluation scale [17], standard error, confidence interval and p value as evaluated by all the three evaluators are given in Table 3. Statistically, there was no significant ($p > 0.05$) difference between all three groups on post-operative days 21 and 90. Pairwise comparison of the three techniques revealed significant p value when compared between surgical excision and diode laser excision on day 7 as evaluated by dental surgeon (p value 0.009, i.e. < 0.05) and layman (p value 0.004, i.e. < 0.05). Table 4 shows comparison of mode of excision of lesion and regions of presentation of the lesion with the mean score on Stony Brook scar evaluation scale [17].

The results stated that on long-term evaluation, there was no statistically significant difference between the three

Table 1 Stony Brook scar evaluation scale [17]

Scar category	No. of points*
<i>I. Width</i>	
> 2 mm	0
≤ 2 mm	1
<i>II. Height</i>	
Elevated or depressed in relation to surrounding skin	0
Flat	1
<i>III. Colour</i>	
Darker than surrounding skin (red, purple, brown, or black)	0
Same colour or lighter than surrounding skin	1
<i>IV. Hatch marks or suture marks</i>	
Present	0
Absent	1
<i>V. Overall appearance</i>	
Poor	0
Good	1

*Total score—sum of individual scores; range, 0 (worst) to 5 (best)

Table 2 Age and sex distribution of study population

Group	Total number of patients	Males (%)	Females (%)	Age range (years)	Mean age (years)
Group A	15	5 (33.33%)	10 (66.66%)	14–62	34.4
Group B	15	10 (66.66%)	5 (33.33%)	24–44	31
Group C	15	3 (20%)	12 (80%)	16–36	26.8
Total	45	18 (40%)	27 (60%)	14–62	30.73

techniques. But the short-term evaluation showed that surgical technique (Fig. 1) was superior to the other two techniques. There was clinically significant hypopigmentation in three patients and seven patients treated with diode laser (Fig. 2) (Group B) and electrosurgical (Fig. 3) (Group C) excision of melanocytic nevus, respectively.

Discussion

The individuals demand to look appealing and attractive is increasing day by day. This compulsive desire to look attractive has resulted in the body dysmorphic disorder (BDD)—Morselli, 1886. The disorder is manifested in people who dislike some aspect of how they look (e.g. mole, or mild acne scarring on the face) to such an extent that they cannot stop thinking and worrying about it. Hence, the individual is keen on treating the cause [18].

The development of the field of facial cosmetic plastic surgery has empowered humans to be able to change the looks which are deformed due to various factors and acquire the attractive looks they desire. Those factors

which influence the face in turn affect the perception of beauty, which include clear or flawless skin, proportion of face, symmetry of face, ageing, etc. Hence, individuals are keen on removal of the mole/nevi.

The present study was conducted in the Department of Oral and Maxillofacial Surgery of our institute. This study aimed to evaluate the efficacy of surgical excision, diode laser and electrosurgery in treatment of nevus. Evaluation was done by three evaluators, i.e. dermatologist, dental surgeon and layman. The three groups—group A (surgical excision), group B (laser excision) and group C (electrosurgical excision)—were evaluated for its clinical efficiency by statistically comparing the results.

In the present study, the mean scar evaluation score was found to increase from post-operative day 7 to post-operative day 90 (3 months). There was no significant difference in the post-operative wound healing between the three groups on day 90 (3 months). Hypopigmentation was present in three out of 15 patients in group B (diode laser excision) and seven out of 15 patients in group C (electrosurgical excision).

Table 3 Comparison of mean scar evaluation score of three treatment modalities as analysed by dermatologist, dental surgeon and layman

Post-operative day	Type of treatment	N	Mean score			SD			SE			95% confidence interval						P value		
												Evaluator 1		Evaluator 2		Evaluator 3		E1	E2	E3
			E1	E2	E3	E1	E2	E3	E1	E2	E3	Upper	Lower	Upper	Lower	Upper	Lower			
POD 7	Surgical excision	15	2.6	1.53	2.93	2.131	0.915	1.534	0.55	0.389	0.396	1.42	3.78	2.03	3.7	2.08	3.78	0.56	0.009*	0.004*
	Diode laser excision	15	1.8	2	1.47	1.424	0.756	0.743	0.368	0.236	0.192	1.01	2.59	1.03	2.04	1.06	1.88			
	Electro surgical excision	15	2.47	3.6	1.93	1.767	1.454	0.704	0.456	0.195	0.182	1.49	3.45	1.58	2.42	1.54	2.32			
POD 21	Surgical excision	15	3.2	2.8	3.6	2.111	1.207	1.454	0.545	0.375	0.375	2.03	4.37	2.79	4.41	2.79	4.41	0.37	0.13	0.1
	Diode laser excision	15	3.2	3.6	2.73	1.568	0.986	1.28	0.405	0.312	0.33	2.33	4.07	2.13	3.47	2.02	3.44			
	Electro surgical excision	15	4	4.53	3.73	1.363	1.06	1.033	0.352	0.254	0.267	3.25	4.75	3.05	4.15	3.16	4.31			
POD 90	Surgical excision	15	4.87	4.27	4.4	0.352	0.884	1.056	0.091	0.274	0.273	4.67	5.06	3.95	5.12	3.82	4.98	0.62	0.4	0.46
	Diode laser excision	15	4.53	4.6	4.33	1.06	0.632	0.816	0.274	0.228	0.211	3.95	5.12	3.78	4.76	3.88	4.79			
	Electro surgical excision	15	4.8	1.53	4.67	0.414	0.915	0.617	0.107	0.163	0.159	4.57	5.03	4.25	4.95	4.32	5.01			

Kruskal–Wallis ANOVA

*Statistically significant

p value < 0.05

Table 4 Comparison of mode of excision of lesion and regions of presentation of the lesion

Mode of excision of nevus	Patients number	Region of presentation of lesion	Mean score*		
			POD 7	POD 21	POD 90
Surgical excision	1.	Left infraorbital region	2.66	3	4.33
	2.	Left angle region of mandible	0	0.66	4.66
	3.	Left periorbital region	0.33	1.66	4.33
	4.	Right infraorbital region	3.33	2	4.66
	5.	Right eyebrow region	4.33	3	4.33
	6.	Right periorbital region	4.33	5	5
	7.	Right cheek region	4.33	5	5
	8.	Left periorbital region	4.33	4.33	4.66
	9.	Right slop of nasal bridge	3.33	3.66	5
	10.	Left corner of mouth	4.33	5	5
	11.	Left chin region	2.33	5	5
	12.	Right angle region of mandible	2	4.33	5
	13.	Left ear lobe	1	0.66	2
	14.	Right cheek region	1.66	2.33	5
	15.	Below and posterior to the left angle of mandible	5	5	5
Diode laser excision	1.	Above left eyebrow	1	1.66	3
	2.	Left cheek region	1	2.66	5
	3.	Left side above upper lip	1.33	1	3.33
	4.	Right corner of mouth	4	5	5
	5.	Right submental region	2.33	2.66	3.66
	6.	Left slop of nasal bridge	0.66	2.33	4.33
	7.	Right side below lower lip	1.66	2.33	5
	8.	Right side below lower lip	1	5	5
	9.	Right cheek region	2.33	3.33	5
	10.	Right slop of nasal bridge	1	2	3.33
	11.	Left angle region of the mandible	2	3	3.66
	12.	Above left eyebrow	2.66	3	4.33
	13.	Right cheek region	1	2	5
	14.	Right side above upper lip	1.33	5	5
	15.	Right cheek region	0.66	2.66	5
Electrosurgical excision	1.	Right periorbital region	3	1.66	3.33
	2.	Nape of neck	1.66	4	4
	3.	Right periorbital region	1.66	4	5
	4.	Right cheek region	1.66	3	4.33
	5.	Left infraorbital region	1	4.66	5
	6.	Above right eyebrow	2.66	4	5
	7.	Left cheek region	3	4.66	5
	8.	Left cheek region	1	2.33	4
	9.	Left corner of mouth	2	2.66	5
	10.	Right side above upper lip	1	5	5
	11.	Right slop of nasal bridge	2.33	5	5
	12.	Right side on forehead	1.66	4.33	5
	13.	Right ala of nose	3.66	4.33	5
	14.	Above left eyebrow	1.66	2	4.66
	15.	Left slop of nasal bridge	3	4	5

*Total score—sum of individual scores; range, 0 (worst) to 5 (best)

Fig. 1 Patient treated with surgical excision of melanocytic nevus. **a** Pre-operative clinical photograph, **b** post-operative day 7 clinical photograph, **c** post-operative day 21 clinical photograph, **d** post-operative day 90 clinical photograph

Tursen U [19] described round or circumferential surgical excision, which is carried out just outside the perimeter of the lesion. This technique may be chosen when the region involved overlies cartilage (i.e. nasal tip or ear rim) or when the best repair orientation or approach is not apparent before the excision. Less skin is excised in the round excision technique (approximately half of that removed using a fusiform excision), and therefore a significant amount of skin is preserved. This technique of round surgical excision was in contrast with the fusiform incision technique used for surgical excision of melanocytic nevus in the present study.

In the present study, surgical excision is a more cosmetically acceptable technique as compared to diode laser excision and electrosurgery due to post-operative complication, i.e. hypopigmentation. These findings were in agreement with the study carried out by Jain et al. [20], wherein serial excision of melanocytic nevus was done and results stated that out of the many methods available, cosmetic result of surgical resection with primary suturing is always preferable whether done in one stage or 2–3 stages.

In a study done by Kilmer et al. [21], 800 nm diode laser was used. The author concluded that 800 nm lightsheer diode laser provides safe and effective treatment for benign pigmented skin lesions. The greatest efficacy was observed with higher frequency, shorter pulse widths, darker nevi and thinner nevi. But in the study, it was mentioned that a transient hypopigmentation occurs at the site of excision after the use of diode laser; this finding was similar to our study, i.e. three out of 15 patients treated with diode laser excision of pigmented nevi showed hypopigmentation post-operatively.

Electrosurgery is also an effective technique for excision of melanocytic nevus from maxillofacial region. The disadvantages of electrosurgery include hypopigmentation and depressed scar. The hypopigmentation caused in electrosurgical group of our study was in accordance with the study previously conducted by Niamtu [6]. The author also stated that hypopigmentation and scarring are extremely rare when proper technique and settings are used.

The present study shows that surgical technique for excision of melanocytic nevus gives better cosmetic results than laser or electrosurgery, which is in accordance with the article published by Sardana et al. [7]. The author also

Fig. 2 Patient treated with diode laser excision of melanocytic nevus. **a** Pre-operative clinical photograph, **b** post-operative day 7 clinical photograph, **c** post-operative day 21 clinical photograph, **d** post-operative day 90 clinical photograph

concludes that a combination of pigment-specific and ablative lasers can also be used to treat acquired or congenital melanocytic nevi effectively.

Silverman et al. [22] compared the histologic appearance of canine skin biopsies collected by use of a scalpel, skin biopsy punch, monopolar electrosurgery, CO₂ laser and radio wave radiosurgery in fully rectified waveform (RWRS). It concluded that RWRS (blended waves in cut/coagulate mode) caused less lateral thermal damage to canine skin biopsies than monopolar electrosurgery and CO₂ laser, and there was less lateral tissue damage to peripheral skin with monopolar electrosurgery. There was no char observed in skin specimens collected by punch and scalpel biopsy, which indicated less or no lateral tissue damage.

In the present study, there was no statistically significant difference between the three groups. The present study in accordance with previous studies states that use of surgical technique for excision of melanocytic nevus is the effective method in comparison with other techniques. Advantages of this technique are that there are fewer chances of recurrence, no post-operative hypopigmentation and the absence of carbonization in the specimen margin yields a

better histopathological picture and is an economical technique.

Laser is the second preferred technique for excision of melanocytic nevus from maxillofacial region, but has only limitation as it should be used with caution in periorbital region in order to prevent ocular damage.

Electrosurgery is also an effective technique for excision of melanocytic nevus from maxillofacial region, but shows post-operative hypopigmentation of the treated wound and can be used in unexposed regions of head and neck.

The limitation of our study was that type of individuals skin was not taken into consideration pre-operatively and hence post-operative wound healing cannot be assessed based on the skin type.

Conclusion

The primary aim of treating melanocytic nevus is to achieve flawless and cosmetically appealing skin. There are numerous ways for excision of melanocytic nevus from maxillofacial region, such as surgical excision,

Fig. 3 Patient treated with electro-surgical excision of melanocytic nevus. **a** Pre-operative clinical photograph, **b** post-operative day 7 clinical photograph, **c** post-operative day 21 clinical photograph, **d** post-operative day 90 clinical photograph

electrosurgery, lasers, dermatome shaving, curettage, dermabrasion, chemical peels, ablative lasers, pigment-specific lasers, liquid nitrogen (cryotherapy) and no treatment (observation) [10]. Considering the currently available treatment modalities, this study has evaluated the efficacy of electrosurgery, diode laser and surgical excision in treatment of nevus. We conclude that statistically, all the three techniques did not show any significant difference on post-operative day 90 (3 months). Hence, the cosmetic results of surgical, diode laser and electro-surgical technique of melanocytic nevus removal were approximately same statistically. But clinically laser excision and electrosurgery excision of melanocytic nevus are more likely to cause post-operative hypopigmentation of the operative site.

Since all three techniques yielded statistically comparable results, the patients can be given a choice of technique to undergo surgery. Surgical excision being the most cost effective may be the treatment of choice for majority of the patients. Further studies need to be carried out on a larger sample size and also considering skin type of individual for more conclusive results.

Compliance with Ethical Standards

Conflict of interest None.

Ethical Approval This study was approved by the ethics committee of the Institution. All procedures performed in the study were in accordance with the ethical standards of the institutional ethics committee.

Informed Consent Informed written consent was obtained from the patient included in the study.

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