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Task of Local Anaesthesia in Major Maxillofacial Surgical Operations (A 36 Case Series Operated in Al-Salam Teaching Hospital)

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Abstract: Oral and maxillofacial surgery is that specialty of dentistry including the diagnosis as well as surgical and adjunctive treatment of diseases, injuries, and defects, including both the functional and esthetic aspects of hard and soft tissues of oral and maxillofacial region. Local anesthesia (LA) also has role in maxillofacial surgeries, some oral and maxillofacial surgical procedures can, however, be performed, with or without conscious sedation depending on the extent of the lesion and the ease of surgical access. We aim in this article to high lighting role of local anesthesia for surgical management of major maxillofacial operations already planned to be operated under general anaesthesia. Sample presentation of major maxillofacial cases that can be underwent under local anesthesia also patients evaluation regarding pain and wound healing. Case series of 36 patients (5-78) years old, from (2004-2013) attained Maxillofacial department at Al-Salam (Mosul) and Al-Kadhimiya (Baghdad) Teaching Hospital. All patients underwent major surgeries under local anesthesia (5-7 cartridges). Patients evaluated regarding pain, wound healing and recovery period. Five patients had moderate intraoperative pain that forced us to increase the dose of local anesthesia, minimal blood ooze one hour postoperatively; healing process was uncomplicated. In accordance to time need for each surgery half of cases need no more than 30 minutes to complete the surgery. More than half of patients (27.77% -33.33%) recommend 4-5 cartridge of local anesthesia uses to complete the surgeries. Oral and Maxillofacial operations which can be managed under local anesthesia are practicable and were tolerated and accepted by the adult patients. Local anesthesia can be used to facilitate safer and more efficient procedures especially in medically compromised patients. Local anesthesia surgeries alleviate risk factors and laryngeal discomfort associated with surgeries under general anesthesia, no starvation and minimal hospital stay.

Keywords: Major Maxillofacial Surgeries, Local Anesthesia, General Anesthesia

1. Introduction

General anesthesia (GA) has a major role in major maxillofacial surgeries. This related to complex anatomy of the face and profound neurovascular supply in the orofacial region [1].

Oral and maxillofacial surgery is that specialty of dentistry including the diagnosis as well as surgical and adjunctive treatment of diseases, injuries, and defects, including both the functional and esthetic aspects of hard and soft tissues of oral and maxillofacial region.

Local anesthesia (LA) is the temporary loss of sensation including pain in one part of the body produced by a

topically-applied or injected agent without depressing the level of consciousness [2].

Local anesthesia (LA) also has role in maxillofacial surgeries, some oral and maxillofacial surgical procedures can, however, be performed, with or without conscious sedation depending on the extent of the lesion and the ease of surgical access.

Many factors that determine whether surgery can be performed under LA or GA include medical conditions of the patients, surgical skill of the operator, age of the patient and time need for surgeries. LA is often preferred for less extensive lesions, where access is favorable and in adults especially when the surgeon is experienced with the use of LA furthermore.

Other factors guiding the choice of anesthesia for maxillofacial procedures include patient's choice of anesthesia, infection at the site of LA injection, available financial resources for the cost of surgery, operating facilities, manpower, and surgeons' choice. Lidocaine is one of the most widely used LA agents. It has a rapid onset and it is effective for about 30–60 minutes in its plain form or up to 90 minutes when used with a vasoconstrictor [3].

Absolute contra-indications for local anesthetics include a documented local anesthetic allergy [4]. True allergy to an amide is exceedingly rare [5]. A bisulfate preservative is used in local anesthetics containing epinephrine. For patients having an allergy to bisulphate's, use of a local anesthetic without a vasoconstrictor is indicated [6].

A long-acting LA (bupivacaine) is not recommended for children or the physically or mentally disabled patients due to its prolonged effect [6]. LAs have well documented bacteriostatic and bactericidal actions [7]. Of these, lidocaine and prilocaine are the most effective [8]. In contrast, bupivacaine showed profound chondrotoxic effects in an experimental intra-articular model [9].

Wound infiltration with LA is a simple, effective and inexpensive means of providing good analgesia [10]. Regional anesthesia has been used successfully in the field of plastic surgery [11, 12]. However, elective cosmetic surgery patients are less tolerant of plastic drains [13].

Peak blood levels of lidocaine usually observed (10–25) min after injection, at which the toxic effects are observed [14]. Cardiovascular toxicity usually manifests itself as tachycardia and hypertension [15]. The treatment of local anesthetic toxicity is essentially supportive [6].

Objectives

High lighting role of LA for surgical management of major maxilla-facial operations already planned to be operated under general anaesthesia (GA) agents. Presentation of samples of maxillofacial cases that can be underwent under LA instead of GA.

2. Materials and Methods

Case series of 36 patients (5-78) years old, from (2004-2013) in Maxillofacial Department in Al-Salam (Mosul) and Alkadhmia Teaching Hospital (Baghdad), Patients operated under LA by infiltration technique (4-7 cartridges of 1.8 ml lidocaine 2%, adrenaline 1/80.000). Most of these surgeries considers to be major maxillofacial surgeries and dealt always routinely under GA technique but patients subjected to the LA operations. Many factors are interfering the use of GA such that systemic problems that interfere with GA agents (like heart failure, ischemic heart diseases and cerebro-vascular insufficiency) or patient receive GA with Flothane within last 2 months. All operations started (5-8) min from last LA injection. The maximum dose was not exceeded 20 ml of LA agent. No sedative drugs used pre- or intra-operative. The duration of operation start from the moment of LA infiltration.

Special form case sheet is prepared for each patient. Descriptive data were recorded include age, gender, time extend for surgery, amount of anesthesia given, Visual Analogue Scale for pain intraoperative and postoperative, admission days also recorded if present all added to wound healing follow up. Special questioner is used to be answered by patients involve VAS for pain [16] while special charts used for evaluation of optimum wound healing to be filled by surgeon himself [17].

Table 1 showed description of cases including Patient code, age, sex, time, cartridge Number, VAS intraoperative and postoperative and admission days. Table 2 described causes, type of surgery and wound healing grade for each patient.

Inclusive criteria are:

1. Patients unfit for general anesthesia
2. Major maxillofacial surgery.
3. Patients agree to undergo surgeries under local anesthesia alone.
4. Medically compromised patients.

Exclusive criteria are:

1. Patients disagree to underwent surgeries under local anesthesia alone.
2. Poor follow up patients.
3. Minor and moderate maxillofacial surgeries.

Special questioner is performed for pain and healing assessment in each patient. For pain VAS (intra and post operatively) assessed [16].

Wound Healing Scale [17] used for assessment of the optimal healing process in each patient in suture removal (7-10) days. The special questioners are answered after examination by surgeon himself.

Statistical analysis by using of SPSS program version 25 was done to assess multiple efficacies of different factors. Outcome was shown in different findings with effects of parameters on each other's.

All work is approved by the scientific committee of Nineveh Health Directory / MOH / Iraq by licenses' Number (14423) in date (16 / 5 / 2019).

3. Result

Thirty six patients under went different major maxillofacial surgeries. (Tables 1, 2).

Table 1. *Description of cases in the sample.*

Pt. Code	Age	Sex	Time Minutes	Carp. No.	VAS IO.	VAS PO	Add. Days
1	41	M	80	5	2	1	Nil
2	36	M	35	4	0	0	Nil
3	62	M	75	5	2	1	Nil
4	35	M	40	5	0	0	Nil
5	15	M	15	3	0	0	Nil
6	17	F	20	6	0	0	Nil
7	64	F	40	4	0	0	Nil
8	67	M	40	5	0	0	Nil
9	65	F	25	5	1	0	Nil
10	36	M	30	6	0	0	Nil
11	41	F	35	6	0	0	Nil
12	46	F	25	6	1	0	Nil
13	62	F	30	5	1	0	Nil
14	68	M	30	4	0	1	Nil
15	68	M	30	4	0	0	Nil
16	68	M	35	4	2	1	1 day
17	68	M	35	4	0	0	Nil
18	68	M	35	4	0	0	Nil
19	68	M	25	4	0	0	Nil
20	68	M	25	4	1	0	Nil
21	66	F	35	5	1	0	Nil
22	74	M	20	7	1	1	2 days
23	63	F	20	5	0	1	Nil
24	19	F	35	5	0	1	Nil
25	34	M	40	6	2	1	Nil
26	35	F	35	7	0	0	Nil
27	45	F	40	7	0	0	Nil
28	54	M	20	6	1	0	Nil
29	61	M	25	5	1	0	Nil
30	5	M	20	5	2	1	Nil
31	32	M	35	6	1	0	Nil
32	19	M	35	6	1	0	Nil
33	78	M	35	6	0	0	1 day
34	24	M	25	7	0	0	Nil
35	36	M	25	4	0	0	Nil
36	38	F	25	5	0	0	Nil

Table 2. *Causes, Type of Surgeries and Wound Healing Grade.*

Case N.	Cause	Treatment	W. Healing
1	Bullet	Total lower lip replacement	6
2	BCC	Lower eyelid replacement	6
3	B-SQ CC	Preauricular Flap	6
4	BCC Cheek	Rhomboid flap	6
5	Bullet Neck	Removal	6
6	Large O. N. F	Cheek flap	6
7	Multiple BCC	Full Thickness skin graft	6
8	BSQ CC	Flap	6
9	Infra Orbital BCC	Flap	6
10	Deformed chin	Onlay genoplasty	6
11	Sleep apnea	Onlay genoplasty	6
12	Large Neurofibromatosis mass in Scalp	Excision	6
13	Infra-orbital BCC	Facial Advancement Flap	6
14	Nasal BCC	Naso Labial Flap	6
15	Nasal BCC	Naso Labial Flap	6
16	Nasal BCC	Naso Labial Flap	6
17	Nasal BCC	Naso Labial Flap	6
18	Nasal BCC	Naso Labial Flap	6
19	Nasal BCC	Naso Labial Flap	6
20	Nasal BCC	Naso Labial Flap	6
21	Facial BCC	Facial Advancement Flap	6
22	Tumour Lower Lip	Excision Sq C C (V Shape) more than 1/3	6
23	Lower Vermillion 2 Small Sq. C. C	Excision Full thickness	6
24	Bullet Injury	Onlay plastic Repair	6
25	Bullet Injury	Onlay plastic Repair	6
26	Dental Implant	Inferior Alveolar Nerve Translocation	6

Case N.	Cause	Treatment	W. Healing
27	Dental Implant	Inferior Alveolar Nerve Translocation	6
28	Lipoma Back of Neck	Excision	6
29	Forehead Tumour	Excision	6
30	Neck Tumour (Submandibular Area)	Biopsy (Child)	6
31	Deep Impacted Lower third Molar	Surgical Removal	6
32	Benign Bone Tumour	Excision (Ossifying Fibroma)	6
33	Verruca's Carcinoma Floor of Mouth	Excision	6
34	Fracture mandible	Intra-osseous Fixation	6
35	Short Lip	Lengthening Upper lip	6
36	Lip Seal Deficiency Post trauma	Lengthening Upper lip	6

Seventeen (47.22%) patients were in age group above 61 years followed by age group between thirty - forty eight patients (22.22%), all showed in table 3.

Table 3. *Age Incidences distribution in the sample.*

Age group	No. of Patients	% of patients
Less than 10 ys	1	2.77%
11-20 ys	4	11.11%
21-30 ys	1	2.77%
31-40 ys	8	22.22
41-50 ys	4	11.11%
51-60 ys	1	2.77%
More than 61 ys	17	47.22%
Total	36	

Concerning with gender distribution (table 4) male demonstrate high incidence than female (66%).

Table 4. *Gender Incidences distribution in the sample.*

Patients	Number of Pt.	% of patients
Male	24	66%
Females	12	33.33%
Total	36	

In accordance to time need for each surgery (table 5) half of cases need no more than 30 minutes to complete the surgery.

Table 5. *Time Length of Surgeries Incidences distribution in the sample.*

Time (min)	No. of Pt.	% of patients
15-30	18	50%
31-60	16	44.44%
61-120	2	5.55%
Total	36	

More than half of patients (27.77%-33.33%) recommend 4-5 cartridge of local anesthesia uses to complete the surgeries (table 6).

Table 6. *LA quantity used in the sample.*

Cartilage No.	No. of Pt.	% of patients
3	1	2.77%
4	10	27.77%
5	12	33.33%
6	9	25%
7	4	11.11%

Five patients only show moderate intraoperative pain that need to increase the amount of anesthesia while 75% describe that no pain observed post operatively (table 7).

Table 7. *VAS for pain (IO. and Po.).*

VAS	No Pain		Mild Pain		Moderate pain		Total
IO. Pain	21	58.33%	10	27.77%	5	13.88%	36
Po. Pain	27	75%	9	25%			36

All cases display good healing process with a follow up period about one and half months (table 2).

Table 8 describes the correlations between multiple parameters which is significant correlations. Regarding gender effect on other parameters, we correlate parameters (table 9) with female once and male once again and Correlation significant at the 0.01 level.

Table 8. *Correlations (2-tailed) in multiple parameters of the sample.*

Correlations						
		Age	Time Minutes	Carp. No.	VAS IO.	VAS PO
Age	Correlation Coefficient	1.000	.071	-.316-	-.005-	.025
	Sig. (2-tailed)	.	.681	.061	.979	.886
Time Minutes	Correlation Coefficient	.071	1.000	.030	.049	.082
	Sig. (2-tailed)	.681	.	.862	.776	.634
Carp. No.	Correlation Coefficient	-.316-	.030	1.000	.140	-.022-
	Sig. (2-tailed)	.061	.862	.	.414	.897
VAS IO.	Correlation Coefficient	-.005-	.049	.140	1.000	.441**
	Sig. (2-tailed)	.979	.776	.414	.	.007
VAS PO	Correlation Coefficient	.025	.082	-.022-	.441**	1.000
	Sig. (2-tailed)	.886	.634	.897	.007	

Correlations					
	Age	Time Minutes	Carp. No.	VAS IO.	VAS PO
**. Correlation is significant at the 0.01 level (2-tailed).					

Table 9. *Correlation according to Gender.*

A. Gender=F

Correlations[a]							
			Age	Time Minutes	Carp. No.	VAS IO.	VAS PO
Spearman's rho	Age	Correlation Coefficient	1.000	.108	-.524-	.615*	-.130-
		Sig. (2-tailed)	.	.738	.080	.033	.688
		N	12	12	12	12	12
	Time Minutes	Correlation Coefficient	.108	1.000	.052	-.184-	-.200-
		Sig. (2-tailed)	.738	.	.872	.566	.533
		N	12	12	12	12	12
	Carp. No.	Correlation Coefficient	-.524-	.052	1.000	-.193-	-.279-
		Sig. (2-tailed)	.080	.872	.	.547	.379
		N	12	12	12	12	12
	VAS IO.	Correlation Coefficient	.615*	-.184-	-.193-	1.000	-.316-
		Sig. (2-tailed)	.033	.566	.547	.	.317
		N	12	12	12	12	12
	VAS PO	Correlation Coefficient	-.130-	-.200-	-.279-	-.316-	1.000
		Sig. (2-tailed)	.688	.533	.379	.317	.
		N	12	12	12	12	12
*. Correlation is significant at the 0.05 level (2-tailed).							
sex=F							

B. Gender=M

Correlations[a]							
			Age	Time Minutes	Carp. No.	VAS IO.	VAS PO
Spearman's rho	Age	Correlation Coefficient	1.000	.060	-.215-	-.168-	.074
		Sig. (2-tailed)	.	.780	.313	.432	.732
		N	24	24	24	24	24
	Time Minutes	Correlation Coefficient	.060	1.000	.077	.146	.182
		Sig. (2-tailed)	.780	.	.721	.496	.394
		N	24	24	24	24	24
	Carp. No.	Correlation Coefficient	-.215-	.077	1.000	.306	.111
		Sig. (2-tailed)	.313	.721	.	.147	.607
		N	24	24	24	24	24
	VAS IO.	Correlation Coefficient	-.168-	.146	.306	1.000	.674**
		Sig. (2-tailed)	.432	.496	.147	.	.000
		N	24	24	24	24	24
	VAS PO	Correlation Coefficient	.074	.182	.111	.674**	1.000
		Sig. (2-tailed)	.732	.394	.607	.000	.
		N	24	24	24	24	24
**. Correlation is significant at the 0.01 level (2-tailed).							
a. sex=M							

In one sample T test differences in age and time need for surgeries parameters also illustrate a high significant p value between the samples prove that these parameters difference between patients have role in the decision for type of anesthesia. (Table 10)

Table 10. *T-Test Differences in age and Time for the sample.*

	T	Df	P - Value
Age	14.545	35	.000
Time Minutes	14.989	35	.000

Table 11, Chi Square Test for cartridges number and pain parameters. P values were significant for cartridge number and highly significant for pain (IO, PO). That explain random election of sample and independent of some of these traits also can affect decision taken.

Three patients out of 36, prefer not to repeat the trial again under LA, due to unavoidable fear from surgical work even no significant pain were experienced during the operation.

Not all patients admitted to the Maxillofacial ward and dismissed from outpatient in clinic 1:30 h postoperatively except for three patients who were already admitted for other reasons. Duration of individual operation ranged from (20–80) minutes. Postoperative blood ooze were minimum over all the cases except for 6 patients with diffused surgical field, routinely, the facial flaps and wounds dressed with Barton bandage (if possible) to minimize postoperative ooze and hematoma.

Table 11. *Chi-Square Test for the nonparametric parameters in the sample Chi-Square Test.*

Test Statistics			
	Carp. No.	**VAS IO.**	**VAS PO**
Chi-Square	11.500[a]	11.167[b]	9.000[c]
Df	4	2	1
Asymp. Sig.	.021	.004	.003
a. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 7.2.			
b. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 12.0.			
c. 0 cells (0.0%) have expected frequencies less than 5. The minimum expected cell frequency is 18.0.			

Optimal wound healing are seen in all patients in the periodic follow up state, with no complications can be mentioned.

4. Discussion

The standard protocol adopted in most maxillofacial surgery hospitals for patients treated under GA involves preoperative admission of patients for evaluation, and postoperative admission for observation and medication. In comparison with that for LA in similar procedures when indicated consistently shows that patients managed under LA may experience better convenience and ease.

The purpose for achieving surgical procedures under LA is to maximize anesthetic and postoperative resources by decreasing operative time in relation to GA and discharging patients' home more efficiently on the same day [18].

In term of hospital stay and health care, this is of particular importance due to cost avoidance on the health care structure. Patient safety and comfort, combined with anesthesia efficacy [19] and the surgeon's expertise, are all important factors in determining the overall usefulness of various anesthetic techniques in oral and maxillofacial surgery. In addition, patients with significant systemic disorders, with relative or absolute contraindication to general or major regional anesthesia can also undergo the procedure safely, indeed. The majorities of hospitals in developing countries are not well equipped and lack the appropriate infrastructure needed for general anesthesia [20]. This lack of sufficient medical infrastructure has been proposed as a reason why many surgeons are hesitant to perform charitable operations in extremely poor areas.

Another important point is the vasoconstrictor (adrenaline) presence which provides bloodless field and prolong the duration of anesthetic effect [21]. It can contribute to the surgeon's comfort during surgery by locally decreasing the bleeding, thus facilitating the surgical procedure and reducing its duration, easier handling of soft tissue distension, and post-operative pain reduction. This practice also permits lower systemic additions of analgesic products pre- and post-operatively.

Still many surgeons had a cautious to use adrenaline due to fear from its systemic or local ischemic effect, while we think that patient outcome and safe when undertaken in an appropriate manner especially in medically compromised patients is so beneficial.

The time elapsed for an individual operation add more to the advantage of LA over GA, reducing the time of GA induction and recovery, obviate the risk effect of GA agents, and avoiding laryngeal discomfort associated with endo-tracheal intubation, in addition, no starvation and minimal hospital stay.

Postoperative pain after discharge can be considered the major challenges associated with maxillofacial surgeries under LA; this is more of a problem among patients managed as day-cases. By correct analgesics use for short period in each patient according to case need can solve the problem. Admitted patients must meet standard discharge criteria postoperatively with LA before being discharged.

It's important to high light two things should also kept in mind when decide to underwent major surgeries under local anesthesia [22]. These are:

1. Duration of local anesthetics. Table 12 shows the time of onset of popular anesthetic solutions with different concentrations of vasoconstrictors, as well as the duration of soft tissue anesthesia.

2. Adverse effects. Local anesthetics are generally safe when used appropriately in the appropriate doses and concentrations. However, they are capable of producing local and systemic toxicity. Minor adverse effects may include post-procedural pain, headache, facial edema, infections, gingivitis and transient paresthesia [23].

Table 12. *Intermediate duration of action of local anesthetics in the US [22].*

Agent		**Onset**	**Soft Tissue**
Articaine	Epinephrine		
4%	1:100,000	1-2 min	3-6h
4%	1:200,000	1-2 min	2-5h
Lidocaine	Epinephrine		
2%	1:100,000	2-3 min	3-5h
Mepivacaine	Levonordefrine		
2%	1: 20,000	1.5 -2 min	3-5h
Prilocaine	Epinephrine		
4%	1: 200,000	2 - 4 min	3-8h
4% Plain	None	2 - 4 min	2-4h

Although we advocate here a major maxillofacial surgeries but we don't face an adverse effect of local anesthesia or the vasoconstrictor.

Considering the low level of complications experienced in the cases reviewed, it can be deduced from this study that more maxillofacial surgical treatments can be carried out under LA than is usually practiced. However, the success of such treatments under LA depends on appropriate case and patient selection [24].

Briefly factors that have prompted the expansion of the scope of maxillofacial surgery under LA were lack of trained anesthetists, medically compromised patient were GA is contraindicated or form dangerous interference, economic barriers against treatment under GA private hospitals. The use of LA with adrenaline expands the ability to perform a variety of procedures in a safer fashion, particularly in high-risk patients. This technique will avoid postoperative nausea and vomiting with early resumption of a normal diet,

performing the surgical procedure on an outpatient basis with early discharge, a lower risk of intra-operative complications (related to cardiac and pulmonary insufficiency).

The ability to communicate with the patient during the procedure, praising patient cooperation or handholding proved to reduce anxiety and fear of the patient. Patient's communication during operation adds more trust in staff and provides positive feedback throughout the whole procedure.

Fear from surgeries can affect patients' cooperation for local anesthesia. patient may deiced not to repeat the trial again under LA, due to unavoidable fear from surgical work even no significant pain were experienced during the operation. This maneuver resulted in reduction of patient's epinephrine level. In addition, an enhanced perception will not be associated with a prolonged postoperative recovery period.

Figure 1. *Oro-Nasal Fistula. Steps of surgery.*

Figure 2. *Squamous. Cell Carcinoma of check.. Steps of surgery.*

Figure 3. *Basal Cell Carcinoma of check. Steps of surgery.*

Figure 4. *Basal Cell Carcinoma of lower Eyelid. Steps of surgery.*

Figure 5. *Chenoplasty. Steps of surgery.*

Figure 6. ***I****nferior Alveolar Nerve Translocation and Dental Implants.*

5. Conclusion

Oral and Maxillofacial operations which can be managed under LA are practicable and were tolerated and accepted by the adult patients. LA can be used to facilitate safer and more efficient procedures specially were GA is contraindicated for many reason as example medically compromised patients.

Abbreviations

GA: General Anesthesia
LA: Local Anesthesia
VAS: Visual Analogue Scale

Conflict of Interest

All the authors do not have any possible conflicts of interest.

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