ORIGINAL ARTICLE

PREDICTIVE FACTORS OF DIFFICULT INTUBATION IN POST BURN NECK CONTRACTURE – A STUDY OF 30 CONSECUTIVE CASES

Vijay Kumar[1], Rajesh Powar[2], Manjunath C. Patil[3], Chaitra[4]

HOW TO CITE THIS ARTICLE:
Vijay Kumar, Rajesh Powar, Manjunath C. Patil, Chaitra. "Predictive Factors of Difficult Intubation in Post Burn Neck Contracture – A Study of 30 Consecutive Cases". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 25, June 22, 2015; Page: 3747-3755.

ABSTRACT: The peri-operative management of post-burn contractures of the neck is a challenge not only to the surgeon but also the anaesthesiologist. A proper co-ordination between them is needed for providing a hassle-free patient care. This is a prospective study done on 30 consecutive patients of post burn contractures of the neck to compare the surgeon's assessment of the type and pattern of post-burn contracture of the neck and the anaesthesiologist's assessment of the airway. The association of this with the peri-operative management of patients was also studied. The data analysed was type of contracture, mento- sternal distance, and preoperative grading of the airway. The method of securing intra-operative airway was documented. A direct co-relation was noted between the type of contracture with the Mallampatti grading of the airway and the sterno-mental distance. All type III contractures required release before intubation. In conclusion, it is advisable for the surgeon to be well-versed with the anaesthesiologist's assessment of the airway and the anaesthesiologist to aware of the types of neck contracture in order to properly plan and execute the peri-operative management of these patients.

KEYWORDS: Neck contracture, Mento – Sternal distance, Mallampatti grading.

INTRODUCTION: Post burn contractures of the neck are common sequelae of deep burns of the neck which heal by secondary intention causing significant physical and psychological morbidity to the patients. Physically it limits the range of motion mainly flexion – extension and also lateral rotation[1]. As the neck region is a visible part scarring in this area also has a psychological impact. The surgical management of these contractures is a challenge both to the surgeon and anaesthesiologist alike. As severe post-burn neck contracture often causes insufficient neck extension and limitations in mouth opening obtaining an access to the airway during anaesthesia is not easy[2,3]. There can be failed attempts at intubation and airway emergencies. During such emergencies one can resort to surgical release of the contractures under local anesthesia or total intravenous anesthesia, followed by intubation of the patient has been recommended[4]. Alternative techniques include awake blind nasal intubation, fiberoptic intubation, and laryngeal mask airway.

It becomes vital that the surgeon and the anesthesiologist co-ordinate and execute the treatment in such patients. The surgeon's preoperative evaluation of the patient is restricted to the type of the contracture and is oriented towards the surgical management without much attention to the airway accessibility. The anaesthesiologist evaluates the patient in terms to the airway accessibility and not towards the surgical complexity. This prospective study is conducted on 30 consecutive cases of post burn contractures of the neck, to arrive at a consensus between

these evaluations and find its relevance in planning the peri-operative management of these patients.

OBJECTIVE: This study is conducted to find an association between the evaluation of the surgeon and the anaesthesiologist and access whether they co-relate with the peri-operative management of post-burn contractures of the neck.

MATERIALS AND METHODS: This is a prospective conducted in KLE's Dr. Prabhakar kore hospital Belgaum. A series of 30 patients were studied. Age, sex, type of contractures, mento-sternal distance, and preoperative grading of airway assessment was documented in the 30 consecutive cases. Patients were evaluated preoperatively for contraindications of anesthesia and graded them according to mallampatti scoring[5] (Table -1). The patients were classified according to the severity of the contracture (Table -2) which range from simple band contracture type I up to involvement of the anterior part and posterior of the neck completely by the contracture in type IV[6,7]. Fig. 1.

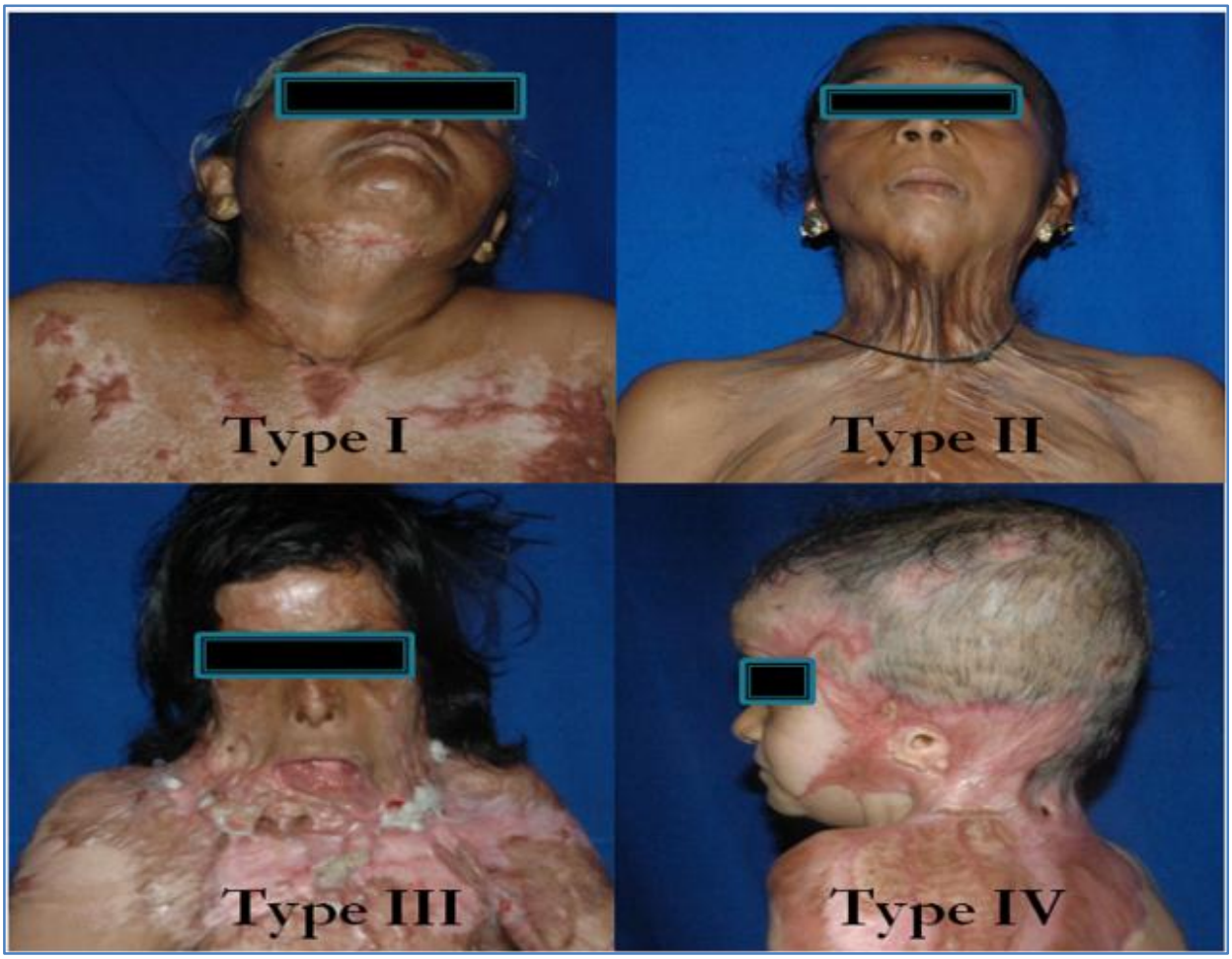

Fig. 1

Class 1	Full visibility of tonsils, uvula and soft palate.
Class 2	Visibility of hard and soft palate, upper portion of tonsils and uvula
Class 3	Soft and hard palate and base of the uvula are visible.
Class 4	Only Hard Palate visible.

Table 1: Mallampatti scoring

Type I	Mild anterior contracture. Patient able to flex the neck and bring the neck and jaws to the anatomical position. Extension: Inability to place an object located on the ceiling.
Type II	Moderate anterior contracture. Patients are able to flex the neck and bring the neck and jaws to the anatomical position while erect. Extension away from the anatomical position result in a significant pull at the (uninvolved) lower lip.
Type III	Severe anterior contracture. Neck in the flexed position and the chin restrained to the anterior trunk. Unable to reach anatomical position of the neck and jaws. Extension: the superior limbus of the unaffected eye is covered and the inferior limbus of the unaffected eye is clearly seen, also it usually pulls on the (uninvolved) lower lip.
Type IV	Posteriorly located contracture. Contracting band at the back of the neck prevents full neck flexion and may hold the neck in some degree of extension.

Table 2: Classification of neck contracture

Patients with difficult intubation/failed intubation, contractures in these patients were released under local anaesthesia (1:100000 lignocaine) premedication with glycopyrolate 0.005mg/kg, midazolam 0.05mg/kg, fentanyl 1-2mg/kg and intravenous ketamine 1-2 mg/kg was given. After releasing the contracture with proper haemostasis, some of the patients required laryngeal mask airway for intubation and some with the regular endotracheal tube. After that meticulous release of contracture was performed and autologous thickish split thickness skin graft harvested. Hemostasis was achieved in the raw area, and the split-skin graft was placed and sutured over the released contractures in the neck. Operative time was about 2 hour. Patient was then given splint for 5 days in neck extension position after which soft neck collar for 9 months to 1 year. Post operatively the clinical photographs of these patients were taken and the contracture release was assessed by measuring the Sterno – Mental distance and Cervico – Mental angle. Results of some of the patients are shown in Fig. 2 & 3.

Fig. 2

Fig. 3

Statistical Analysis: Statistical analyses were performed to determine the association between the pre-operative mallampatti grading, sternomental distance and intraoperative difficulty in intubation and requirement of the contracture release for the intubation purpose. Analysis was done using Spearman's Rank correlation coefficient and Karl Fischer's test was used to determine whether there were significant differences between each group. The statistical significance was established at p=0.05.

RESULTS: Total 30 patients of which 26 females and 4 males. Age of the patient ranged from 5 years to 70 years, mean age of 37.5 years. 28 patients had type II and type III and one each of type I and type IV. 22 patients were grade II and above of mallampatti scoring. Sternomental distance in preoperative period was ranging from 0 to 14cms with average of 7 cms, whereas post operatively all patients sternomental distance measured between 13-18 cms. 10 patients had difficulty in intubation and required release of contracture before intubation and 6 patients were managed with laryngeal mask airway. There were no complications in perioperative period of any patients. The details of all 30 patients and the mode or perioperative management are given in Fig. 4. Mallampatti grading and difficulty in intubation with pre-operative sterno-mental distance was compared with each other and association between them with significant p valve (Table: 3). The comparison of neck contracture type with pre OP Sterno-mental distance also showed a significant p valve (Table: 4).

Sl no	Age/sex	MPG	Neck contracture Type	Sterno-mental distance		Cervicomental angle(degree)		Difficult intubation
				Preop	Postop	Preop	Post op	
1	16/F	II	II	10cm	18cm	170	145	No
2	17/F	IV	III	3 cm	14cm	50	140	Yes
3	14/m	I	II	12cm	13cm	120	130	No
4	38y/F	II	III	3.5cm	15cm	40	130	Yes
5	40y/F	I	I	12.5cm	13.5cm	110	120	No
6	12y/F	IV	III	1cm	13cm	10	145	Yes
7	22y/F	III	II	8cm	14.5cm	110	140	LMA
8	31y/F	I	II	12cm	15cm	170	145	No
9	19y/F	III	III	3cm	13cm	40	135	Yes
10	27/F	I	II	12cm	18cm	120	140	No
11	24y/F	III	II	11cm	16cm	100	145	No
12	54y/M	III	III	5cm	15cm	60	130	Yes
13	14y/F	II	III	2cm	15cm	20	110	Yes
14	23y/M	II	II	14cm	17cm	165	125	LMA
15	14y/F	IV	III	2cm	16cm	35	120	Yes
16	28y/F	I	II	11cm	17cm	130	160	No
17	21y/F	II	II	8cm	14cm	110	145	LMA
18	31/F	I	II	12cm	16cm	125	150	No
19	13y/F	II	II	13cm	15cm	165	125	No
20	42y/F	II	II	7cm	14cm	80	130	No
21	70y/M	II	III	6cm	13cm	40	120	No
22	25y/F	I	II	8cm	14cm	115	145	LMA
23	43y/F	III	III	2cm	15cm	40	140	Yes
24	36ym	II	II	6cm	15cm	160	135	No
25	33y/F	II	II	4cm	16cm	30	140	LMA
26	5y/M	I	IV	13cm	13cm	110	110	No
27	35y/F	II	II	11cm	14cm	100	140	No
28	52y/F	II	II	9cm	14cm	110	135	LMA
29	23y/F	IV	III	0	13cm	0	125	Yes
30	33y/F	II	III	4cm	13cm	30	130	Yes

Fig. 4

	Spearman's R	**t-value**	**P-value**
MP grades with pre OP Sterno-mental distance	-0.7194	-5.4802	0.0000*
Difficulty in intubation with pre OP Sterno-mental distance	-0.8070	-7.2318	0.0000*

Table 3: Correlation between Mallampatti grades and difficulty in intubation with pre OP Sterno-mental distance by Karl

$P < 0.05$ is significant.

	Spearman's R	t-value	p-level
Neck contracture Type with pre OP Sterno-mental distance	-0.6432	-4.4453	0.0001*

Table 4: Correlation between Neck contracture Type with pre OP Sterno-mental distance by Karl

$P < 0.05$ is significant.

DISCUSSION: Post-burn contractures in the neck often cause anatomical distortion and restriction of neck movements, resulting in varying degrees of difficulty in airway management. 'Difficult airway' is one in which there is a problem in establishing or maintaining gas exchange via a mask, an artificial airway or both. The principles of management of the potentially difficult airways are airway assessment, mobilization of human and material resources, process of airway control by intubation or other methods, monitoring and aftercare of the patients. Different options of airway management are Conventional immediate intubation, Awake intubation with flexible fibreoptic bronchoscope, Awake intubation with rigid fibreoptic laryngoscope, Laryngeal mask airway anaesthesia and scar release then intubation if needed, Pre-induction scar release under local anaesthesia then tracheal intubation, Face mask ventilation followed by surgical scar release then tracheal intubation, Surgical scar release under ketamine and local anaesthesia then intubation, , Intubating laryngeal mask airway[8]. We have formulated an algorithm for the difficult intubation which is shown in Fig. 5.

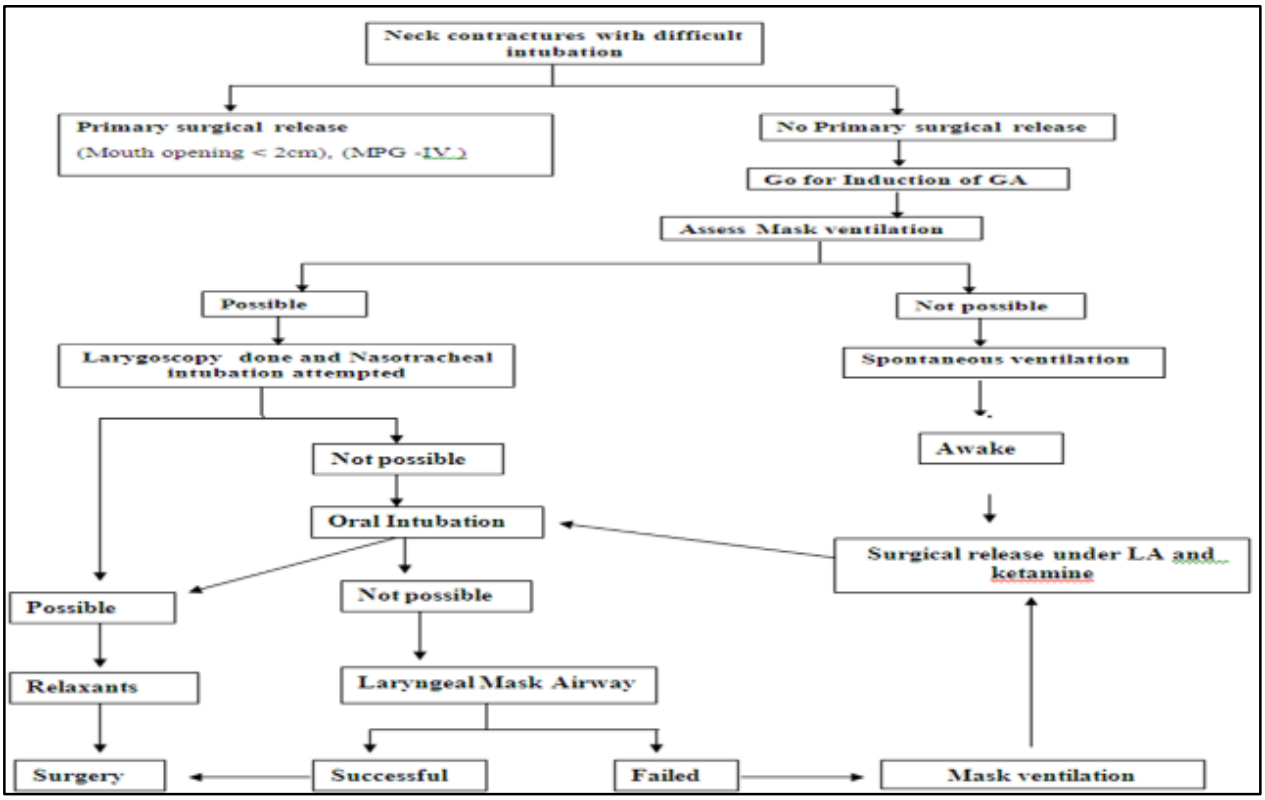

Fig. 5

Many methods have been advocated to reconstruct severe neck contracture, including split-thickness and full-thickness skin grafts, dermal substitutes combined with skin grafts, local or pedicle flaps with or without tissue expanders, pedicle or free flaps. Assessing the difficult airway we have considered Mallampatti grading, Sterno – Mental distance and the type of neck contracture[4].

CONCLUSIONS: In conclusion there is a direct association between type of neck contracture and Mallampatti grading with sterno – Mental distance to the prediction of difficult intubation. Thus, anaesthesiologists must always be prepared with a variety of preformulated and practiced plans for airway management and the surgeon must be available during the induction of anaesthesia to perform an emergency neck release if necessary.

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AUTHORS:

1. Vijay Kumar
2. Rajesh Powar
3. Manjunath C. Patil
4. Chaitra

PARTICULARS OF CONTRIBUTORS:

1. Consultant, Department of Plastic and Reconstructive Surgery, KLE Society Hospital and Medical Research Centre, Nehru Nagar, Belgaum.
2. Professor and HOD, Department of Plastic and Reconstructive Surgery, KLE Society Hospital and Medical Research Centre, Nehru Nagar, Belgaum.
3. Assistant Professor, Department of Plastic and Reconstructive Surgery, KLE Society Hospital and Medical Research Centre, Nehru Nagar, Belgaum.
4. Senior Resident, Department of Plastic and Reconstructive Surgery, KLE Society Hospital and Medical Research Centre, Nehru Nagar, Belgaum.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Vijay Kumar,
Consultant,
Jawaharlal Nehru Medical College,
Belgaum.
E-mail: viju_n2@yahoo.co.in

Date of Submission: 19/06/2015.
Date of Peer Review: 20/06/2015.
Date of Acceptance: 22/06/2015.
Date of Publishing: 22/06/2015.