Modified Risdon approach using periangular incision in surgical treatment of subcondylar mandibular fractures

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SUMMARY

Introduction No consensus has been reached yet on the surgical approach for treatment of condylar fractures.

Objective The aim of this study was to present modified Risdon approach (without facial nerve identification) in the treatment of subcondylar mandibular fractures.

Method This is a retrospective study of a period 2005–2012. During this seven-year period, 25 condylar mandibular fractures in 22 men and three women (19–68 years old) were treated by modified Risdon approach without identifying the facial nerve. The main inclusion criterion was subcondylar fracture according to Lindahl classification.

Results No additional morbidity related to postoperative complications, such as infection or salivary fistula, was observed in this series. Only two (8%) patients developed temporary weakness of the marginal branch of the facial nerve, which resolved six weeks postoperatively. Each patient achieved good mouth opening postoperatively. Scar was camouflaged in the first cervical wrinkle. Two patients developed temporomandibular joint dysfunction. No patient had postoperative occlusal disturbance. In all of the patients good aesthetic result was achieved in a two-year follow-up.

Conclusion In comparison with techniques described in the literature, the main advantages of the modified Risdon approach are the following: no need for facial vessels identification; direct, fast, and safe approach to mandibular angle and subcondylar region; relatively simple surgical technique and good cosmetic result – due to aesthetically placed incision. This approach could be recommended for subcondylar fracture as a simplified and safe procedure.

Keywords: subcondylar fracture; extraoral approach; open reduction

INTRODUCTION

Open approaches for treating patients with mandibular fractures have been used in the modern era of maxillofacial traumatology since the implementation of internal fixation [1]. No consensus has been reached yet over the surgical approach for treatment of condylar fractures. However, many authors support an opinion that open reduction and internal fixation provide good functional outcome [2, 3].

Beside intraoral endoscopic-assisted surgical procedures, the conventional extraoral treatment approaches, such as the submandibular, retromandibular (transparotid and retroparotid), preauricular and modified Risdon approach are still in use. Some of these approaches, like transparotid, are very complex, and require identification and preservation of certain anatomical structures like buccal and marginal branches of the facial nerve, which is time consuming surgery [4]. On the other side, postoperative neuropraxia of the mandibular branch of the facial nerve (MBFN) has been reported as the main complication of the classic Risdon's procedure and care should be taken to minimize this risk [5]. In order to avoid this complication conventional approaches have been modified [6, 7, 8].

In order to reduce this risk, some authors recommend direct access to the mandible through submandibular gland without identification of the MBFN. This procedure involves elevating the superior flap and can be used for mandibular fractures as well [1, 5]. The routine exploratory identification of the MBFN nerve is still a matter of debate.

OBJECTIVE

The aim of this study is to describe modified Risdon approach (without facial nerve identification) in surgical treatment of subcondylar mandibular fractures and to examine the effectiveness of this method in open reduction and internal fixation.

METHODS

Surgical technique

Modified Risdon approach to the subcondylar region was performed under general anesthesia. To control bleeding, the surgical site was infiltrated with a solution of lidocaine and epinephrine (1:80,000).

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There are several important anatomical landmarks for this procedure: 1. platysma layer; 2. superficial layer of deep cervical fascia (SLDCF) – investing fascia; 3. anterior superior border of sternocleidomastoid muscle (SCMM), and 4. posterior border of submandibular gland (SG).

The periangular incision was placed into the first cervical crease 1.5–2 cm from the gonion, being about 5 cm long (Figure 1). After skin and subcutaneous tissue incision, platysma was dissected carefully in order to preserve SLDCF because the MBFN is just above or adherent to the mentioned fascia (Figure 2). SLDCF was incised meticulously at the precise determined localization, 2 cm below the mandibular angle and above the anterior border of the SCMM (Figure 3). The subfascial space (under SLDCF) was entered using blunt scissors between the anterior border of the SCMM (landmark #3) and posterior border of the SG (landmark #4). This space is avascular and safe – it represents a keyhole for this approach. Dissection, which could be carried out either by scissors or fingertip, was continued further towards the angle of the mandible. It is very easy to identify lower border of the mandibular angle by palpation and elevation of SLDCF with overlying tissue. This manoeuvre provided exposure of pterygo-masseteric sling. It has to be highlighted that this approach does not require visualization and identification of the MBFN. Mild retraction of submandibular gland anteriorly and sternocleidomastoid muscle posteriorly provides enough space for safe incision of periosteum along the lower border of the mandibular angle (Figure 4). Masseter muscle was then stripped from the angle and along the posterior border of the ramus to identify fracture line and bony fragments. Adequate subperiosteal dissection over the mandibular

Figure 1. Placement of periangular incision

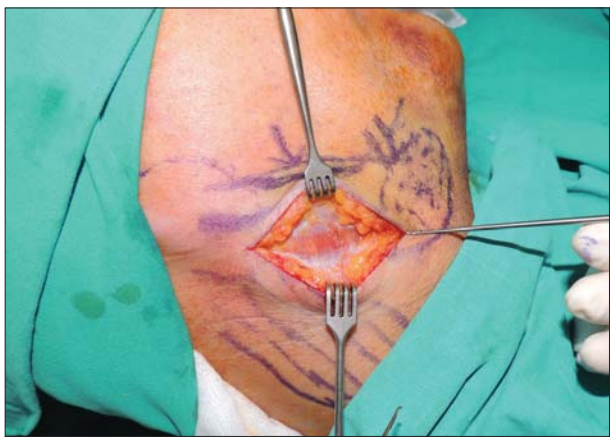

Figure 2. Platysma layer

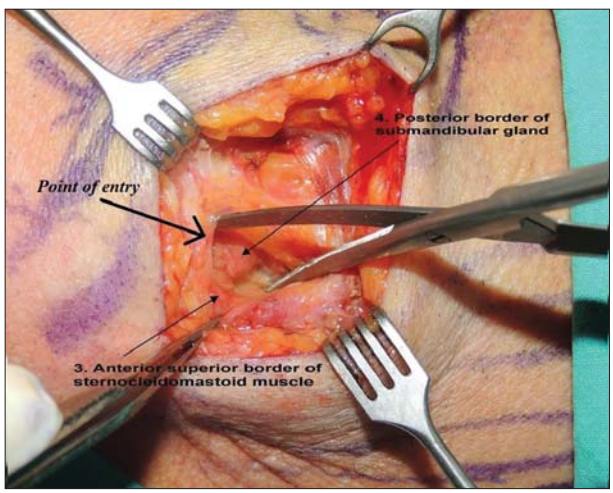

Figure 3. Cutting of the superficial layer of deep cervical fascia – point of entry into subfascial space

Figure 4. Safe incision of periosteum along the lower border of the mandibular angle

Figure 5. Bony fragments after reduction

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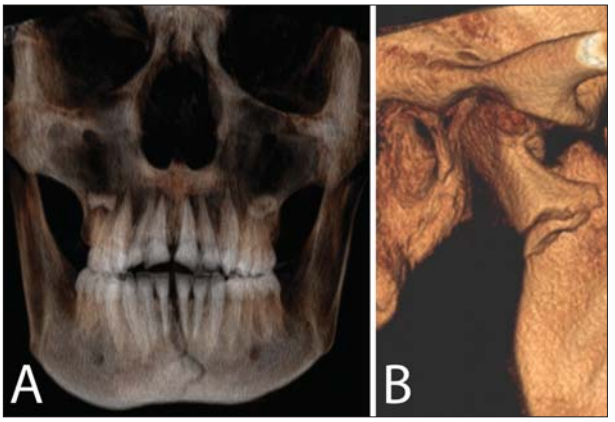

Figure 6. Preoperative cone beam computed tomography (SCANORA® 3Dx, SOREDEX, Tuusula, Finland): a) preoperative postero-anterior radiogram 3D; b) preoperative 3D picture of left the right subcondylar fracture

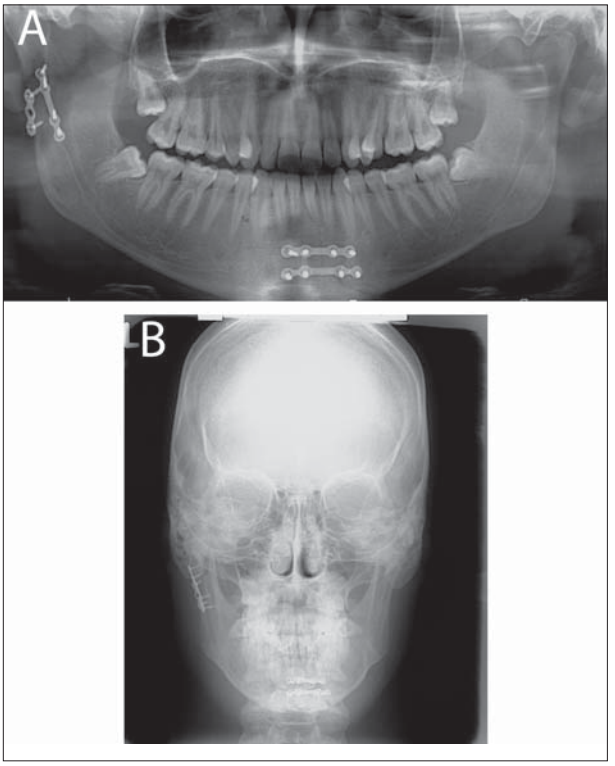

Figure 7. a) Postoperative ortopantomogram; b) Postoperative postero-anterior radiogram

ramus provided good exposure of the fracture site in order to reduce the fracture fragments and to place internal fixation (Figure 5). Retromandibular vein could be visualized posteriorly and should be preserved.

The access to the fracture site with this approach usually takes between five and 10 minutes and there is no significant bleeding. In all cases a plating system was used for rigid internal fixation. The wound was irrigated, checked for hemostasis, and closed in the following four layers: the periosteum, superficial cervical fascia with platysma, subcutaneous layer, and skin. Skin was closed with intradermal suture. A suction drain was usually removed after two days. X-rays showed preoperative findings and appropriate anatomic reduction (Figures 6 and 7).

Patients

Twenty-five patients with mandibular fractures at 34 sites including subcondylar enrolled in this study. There were 22 male and three female patients, ranging from 19 to 68 years of age. They were surgically treated at the Department of Maxillofacial Surgery between 2005 and 2012 using a modified Risdon approach without identifying the facial nerve (Table 1). The other fracture sites were treated using open reduction with an intraoral approach, or combined approaches in some complex cases. The routine preoperative investigation comprised clinical examination and digital ortopanoramic and posterior–anterior radiograms of the mandible. All the patients selected for open reduction and internal fixation had posttraumatic malocclusion and showed radiological signs of the displaced fracture. The main inclusion criteria in this study group were displaced subcondylar fractures according to Lindahl classification with occlusal disturbance and deflection [9]. In all patients postoperative review of above mentioned radiograms were compared with the preoperative ones and the following clinical signs were noted: mouth opening, occlusion, temporomandibular joint (TMJ) dysfunction and facial nerve damage.

RESULTS

In all patients good anatomical position of bone fragments were achieved. No postoperative complications, such as infection or salivary fistula, were observed in this series. Only two (8%) patients developed temporary weakness of the MBFN, which resolved six weeks postoperatively. Each patient achieved good mouth opening with no deflection. Two patients developed TMJ dysfunction, clicking that was treated conservatively (Table 1). No patient had postoperative occlusal disturbance. In all the patients good aesthetic results were achieved.

DISCUSSION

Risdon has described submandibular approach for TMJ ankylosis in 1934, which has been traditionally used for many years [10]. In 1963, Ginestet et al. [11] illustrated a curve-shaped incision at the mandibular angle for extraoral ectopic wisdom teeth extraction, without detailed description of the procedure. Using Risdon approach, Nam et al. [12] described treatment of subcondylar fracture trough submandibular incision placed 3 cm or more below the inferior border of the mandible because of the close vicinity of the MBFN. This is a classic submandibular approach that is technically demanding because of longer route to fracture site and more difficulties in fragment reducing and plating. The use of periangular incision provides direct access to the angle of the mandible and is closer to the subcondylar area. Furthermore, surgical anatomy of the MBFN presents great variability in the literature [13, 14, 15]. Ziarah and Atkinson [16] pointed out that the

Table 1. Open reduction group

ID	Sex	Age	Lindahl	Location	Etiology	Occlusion	Opening	TMJ dysfunction	VII damage	Follow-up (months)
1	M	33	L/D	Left	IPV	Normal	Good	No	no	16
2	M	44	L/D	Bilateral	IPV	Normal	Good	No	no	17
3	M	20	L/D	Left	IPV	Normal	Good	No	no	20
4	M	52	L/D	Left	IPV	Normal	Good	No	no	18
5	M	27	L/D	Left	IPV	Normal	Good	NO	yes	18
6	M	41	L/D	Left	IPV	Normal	Good	Right TMJ click	yes	72
7	M	21	L/D	Left	IPV	Normal	Good	No	no	60
8	M	19	L/D	Left	IPV	Normal	Good	No	no	65
9	F	41	L/D	Left	FFH	Normal	Good	No	no	60
10	M	19	L/D	Left	IPV	Normal	Good	No	no	60
11	M	68	L/D	Bilateral	IPV	Normal	Good	Deviation	no	57
12	M	54	L/D	Left	IPV	Normal	Good	No	no	56
13	M	41	L/D	Left	FFH	Normal	Good	No	no	62
14	M	32	L/D	Right	IPV	Normal	Good	No	no	15
15	M	28	L/D	Right	FFH	Normal	Good	No	no	18
16	M	29	L/D	Right	IPV	Normal	Good	No	no	32
17	F	48	L/D	Right	TA	Normal	Good	No	no	24
18	M	31	L/D	Right	IPV	Normal	Good	No	yes	30
19	M	21	L/D	Right	IPV	Normal	Good	No	no	66
20	M	24	L/D	Right	IPV	Normal	Good	No	no	48
21	M	39	L/D	Right	IPV	Normal	Good	No	no	36
22	M	27	L/D	Right	IPV	Normal	Good	No	no	48
23	M	28	L/D	Left	FFH	Normal	Good	No	no	60
24	F	29	L/D	Left	TA	Normal	Good	No	no	48
25	M	56	L/D	Left	WRI	Normal	Good	No	no	48

ID – patient ID; Lindahl – classification (M – medial overlap, L – lateral overlap, NO – no overlap, ND – no displacement, SD – slight displacement, MD – moderate displacement, D – dislocation); TMJ – temporomandibular joint; IPV – interpersonal violence; FFH – fall from height; TA – traffic accident; WRI – work related injury

MBFN could be traced 0.2–1.4 cm below the mandibular angle. Hayes Martin manoeuvre, described within submandibular approach, may not always be considered safe [17]. Because of that, other authors suggest identifying and dissecting the MBFN for more safety [12, 15]. It has been even reported that MBFN can occasionally cross under the facial artery and vein [15]. Some surgeons have pointed out the utility of the surgical approach underneath the submandibular gland fascia without the routine identification of the mandibular nerve, which actually minimizes the risk of nerve damage [10, 18, 19]. Nevertheless, using submandibular approach, surgeons usually face long tunnel to the subcondylar area and stronger tissue traction is always necessary to reach fracture site, which can cause neuropraxia of mandibular branch of facial nerve. However, using a simplified technique described in this study, the tunnel is significantly shorter. Furthermore, the surgical layer of the subfascial flap, which is elevated in order to access the mandibular border, can be identified precisely using various anatomic landmarks mentioned where surgical technique is described. There is no need for facial blood vessels identification and ligation. Comparing to other approaches, this method does not require identification and visualization of the MBFN [12]. It is crucial to avoid dissection or tissue traction directly over the masseter muscle due to variability of the route of the MBFN [16]. It is absolutely necessary to respect each layer and to dissect "one by one," as described (Figure 3). The crucial step is to perforate SLDCF near anterior border of the SCMM and 2 cm below the mandibular angle and dissect it from the posterior border of the SG. This distance of 2 cm should be reached due to variability of the rout of the MBFN [16]. It provides the safe zone, which is best to enter by blunt finger dissection. It is a very important manoeuvre, needed in order to avoid blood vessels and nerves, and is a very quick way in approaching mandibular angle and visualizing pterygo-masseteric sling. This also provides less tissue traction and manipulation during reduction and fixation of bone fragments.

In this series, only two (8%) patients developed temporary facial nerve weakness. The frequency of temporary facial palsy after extraoral approaches to the subcondylar region varies in the range 0–30% [20–24]. Hou et al. [25] found that after modified transparotid approach, 22% of patients suffered from temporary facial palsy. Using retromandibular approach, two authors described two cases of permanent facial palsy after five years of follow-up, although damage to the facial nerve frequently produces weakness of the depressors of the mandible [25]. In all cases, the neuropraxia is transient, and the cause might be compression of the nerve by retractors or nerve manipulation.

According to literature, submandibular approach showed the worst outcome regarding permanent palsy of the facial nerve and hypertrophic/visible scarring. Additionally, the

extraoral scars of the submandibular and preauricular approaches were significantly longer than those of the retromandibular approach [26]. Using the modified Risdon approach, the scars were barely noticeable and always hidden. There were no signs of hypertrophic scaring in this study.

CONCLUSION

The main advantages of the modified Risdon approach described in this study were the following: low risk for the mandibular branch of facial nerve damage; no identification and visualization of the mandibular branch facial nerve; no need for blood vessel identification (facial artery and vein); direct, fast, and safe approach to the mandibular angle and subcondylar region; relatively simple surgical technique and good cosmetic result – due to aesthetically placed incision.

ACKNOWLEDGEMENT

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Модификовани Риздонов приступ кроз периангуларну инцизију у хируршком лечењу субкондиларних прелома доње вилице

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Увод У литератури не постоји консензус у погледу хируршког приступа за лечење прелома кондиларног наставка доње вилице.

Циљ рада Циљ рада је био да прикаже модификовани Риздонов приступ (без идендификације фацијалног живца) у лечењу субкондиларног прелома доње вилице.

Методе рада Ова ретроспективна студија односи се на период од 2005. до 2012. године. Током седам година, 25 субкондиларних прелома доње вилице код 22 пацијента мушког пола и три женског пола (19–68 година) третирано је модификованим Риздоновим приступом без идентификације фацијалног живца. Основни критеријум за укључење пацијената у студију био је присуство субкондиларног прелома доње вилице према Линдахловој класификацији.

Резултати У постоперативном току нису биле присутне саливарне фистуле и инфекција. Код два пацијента (8%) била је присутна привремена пареза маргиналне гране фацијалног живца, која се повукла у року од шест недеља. Код свих пацијената је успостављено нормално отварање уста постоперативно. Ожиљак је добро скривен у првој вратној бори. Два пацијента су испољила симптоме дисфункција темпоромандибуларног зглоба. Код свих пацијената постигнут је добар естетски резултат у двогодишњем периоду праћења.

Закључак У поређењу са техникама описаним у литератури, основне предности модификованог Риздоновог приступа су следеће: одсуство потребе за идентификацијом фацијалних крвних судова; директност, што омогућава брз и безбедан приступ углу доње вилице и субкондиларној регији; релативна једноставност хируршке технике, као и естетски позиционирана инцизија. Овај приступ може бити препоручен за лечење субкондиларног прелома доње вилице, као једноставан и безбедан.

Кључне речи: субкондиларни прелом; екстраорални приступ; отворена редукција

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