Case Report

DOI: 10.7860/JCDR/2023/65288.18490

Deep Subfascial Approach in the Management of Zygomatic Arch Fracture: A Case Report

Dentistry Section

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ABSTRACT

Even for the most skilled maxillofacial surgeon, gaining access to the zygomatic arch for surgical procedures can be difficult due to the potential obstruction caused by a depressed zygomatic arch fracture, leading to restricted mouth opening. There are various treatment options available for zygomatic arch fractures. This article discusses the deep subfascial technique as a means to access the Temporomandibular Joint (TMJ) and zygomatic arch. This surgical procedure ensures a secure operative field while minimising the risk to facial nerve branches. Here, the authors present the case of a 62-year-old male patient who sustained a right zygomatic arch fracture in a road traffic accident. The fractured segments were treated surgically through open reduction and internal fixation using the deep subfascial approach. The procedure resulted in minimal post-operative discomfort, no functional impairment, successful reduction of the fracture, and restoration of function.

Keywords: Alkayat-bramley incision, Facial nerve, Pre-auricular, Trauma

CASE REPORT

A 62-year-old male patient presented to the Department of Oral and Maxillofacial Surgery with complaints of pain and reduced mouth opening. His history revealed involvement in a car accident on the previous day. No significant medical or social history was reported. Clinical evaluation indicated characteristic signs of a zygomatic arch fracture, including facial flattening in the bird's-eye view, depression over the arch, tenderness, crepitus upon palpation, and limited mouth opening [Table/Fig-1].

[Table/Fig-1]: Clinical picture of the patient in bird's-eye view.

To confirm the clinical findings and visualise the fractured segments, a Computed Tomography (CT) scan with Three Dimensional (3D) reconstruction was performed. The scan revealed a comminuted and displaced fracture of the right zygomatic arch [Table/Fig-2-4]. The patient underwent routine investigations including a haemogram, random blood sugar, serum electrolytes, serum creatinine, blood urea, Human Immunodeficiency Virus (HIV), Hepatitis C Virus (HCV) and Hepatitis B surface antigen (HBsAg), all of which yielded normal results. Informed consent for the surgical procedures was obtained from the patient. Under general anaesthesia with nasotracheal intubation, open reduction and internal fixation following right zygomatic arch elevation were planned.

The skin and intraoral areas were prepared with betadine, and the temporal region of the scalp, 2.5 cm above the ear helix, was shaved. Sterile pads were applied to protect the eye, and sterile drapery was used for facial preparation. Haemostasis was achieved

[Table/Fig-2]: Preoperative 3D-CT scan of the patient (Frontal view).
[Table/Fig-3]: Preoperative 3D-CT (Computed tomography) scan of the right zygomatic arch (Lateral view). (Images from left to right)
[Table/Fig-4]: Preoperative axial CT showing a medially displaced right Zygomatic arch. (Arrow in) image below.

by infiltrating Xylocaine with 1:80,000 adrenaline over the incision site. The preoperative incision design was marked under aseptic conditions [Table/Fig-5]. The Al-Kayat-Bramley incision [Table/Fig-6] began a pinna's length from the ear, antero-superiorly just within the hairline, and curved backward and downward until reaching the upper attachment of the ear. The pre-auricular approach followed the ear attachment. The 45-degree temporal incision was made to reach the temporal fascia and areolar fat tissue through the epidermis and superficial fascia. This incision exposed the temporalis muscle by continuing through both layers of the temporalis fascia and the surrounding fat [Table/Fig-7]. Further dissection in this plane continued inferiorly until reaching the medial zygomatic arch. This approach differs from dissecting the subfascial plane and accessing the arch from the superior aspect.

A blunt dissection was performed downward, exposing the temporalis fascia, while maintaining a position two centimeters above the malar

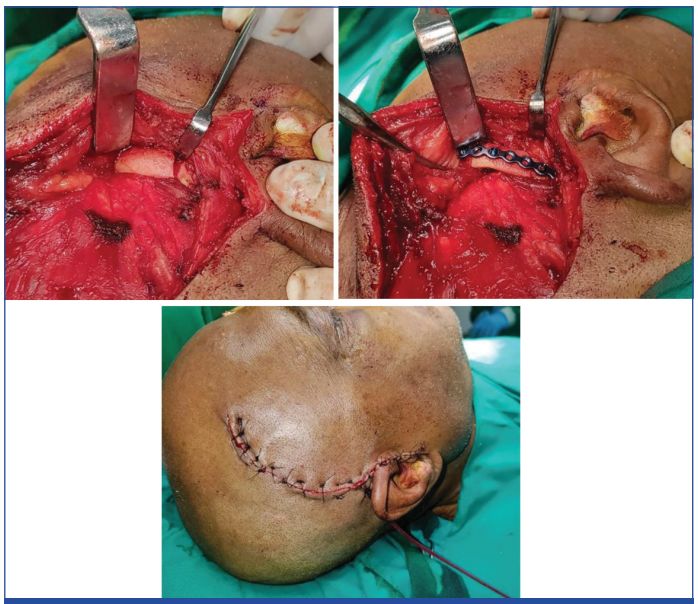
[Table/Fig-5]: Preoperative incision design.

[Table/Fig-6]: Clinical picture of the Al-Kayat-Bramley incision.

[Table/Fig-7]: Deep subfascial approach.

arch to protect the superficial temporal arteries. The fascia was cut to expose the temporalis muscle. The superior aspect was used to approach the arch after making an incision in the subfascial plane. The flap was then shifted forward by making an incision on the medial zygomatic arch. The Howarth's periosteal elevator's broad end was inserted at the temporalis fascia-muscle junction. Further visual dissection in the same plane was required to construct a tunnel and fully expose the zygomatic arch [Table/Fig-8]. Elevation was performed to restore the anatomical contour, and irrigation was done using saline and betadine. Fracture fragments were fixed using a seven-hole (2 mm) continuous titanium plate and four (2*6) mm self-tapping titanium screws at both ends of the arch (stable bone) [Table/Fig-9]. A drain was placed, and primary suturing of the skin and subcutaneous tissues was performed using 4-0 ethilon sutures [Table/Fig-10].

No complications were reported following the surgery. The intraoperative image after completion of the procedure demonstrated a bilaterally symmetrical restored arch form [Table/Fig-11]. The post-operative X-ray confirmed alignment of the fracture segments without any bone, discontinuity [Table/Fig-12]. The patient was discharged after receiving post-operative instructions. Antibiotics (Augmentin-625 mg BD for seven days) and analgesics were prescribed for one week. At the 10-day follow-up, the patient had no post-operative issues [Table/Fig-13], and the healing was satisfactory.



[Table/Fig-8]: Zygomatic arch fracture exposed.
[Table/Fig-9]: Fracture segments anchored to the Titanium plate with self-tapping screws. (Images from left to right)
[Table/Fig-10]: Wound closure using 4-0 ethilon sutures. (Image below)

[Table/Fig-11]: Restored arch form. **[Table/Fig-12]:** Post-operative submentovertex view radiograph. (Images from left to right)
[Table/Fig-13]: Post-operative picture after 10 days. (Image below)

DISCUSSION

The zygomatic arch, a prominent maxillofacial bone, is often affected by facial trauma, requiring surgical exposure for open reduction and internal fixation of the fracture [1]. Accessing the joint poses a challenge due to the presence of the facial nerve and its branches, particularly the vulnerable temporal branch during Temporomandibular Joint (TMJ) surgery [2]. Preservation of facial nerve branches is essential when approaching the zygomatic arch [3]. Timely surgical intervention and early diagnosis are crucial for zygomatic arch fractures, with surgery recommended within one week of the incident [4].

The Al-Kayat-Bramley approach, which dissects the zygomatic arch from the outside in reveals the following layers: skin, subcutaneous tissue, superficial temporal fascia, subgaleal fascia, temporalis fascia, and temporalis muscle [5]. The 45-degree temporal incision should reach the temporal fascia and areolar fat tissue through the epidermis and superficial fascia [1]. In dissecting the temporal area, the "deep subfascial approach" offers several advantages compared to standard methods. This technique provides an additional layer of protection for the temporal and zygomatic branches of the facial nerve, specifically the deep layer of the temporalis fascia and the superficial layer of the temporal fat pad. The plane of dissection is easily identifiable and consistent, and the technique can be easily executed with a basic understanding of the anatomy of the dissected area [1].

In the reported case, the fractured arch may impinge on the coronoid process, resulting in restricted mouth opening. The Gillies temporal method, percutaneous hook, or intraoral approach can be used for arch reduction. Stabilisation of the zygomatic arch is necessary depending on the location of the injury, the number of fragments, and the degree of displacement. Ogden GR found that fixation was required in 10 out of 126 cases [6]. A Kirschner wire can be used to stabilise the fractured and unstable zygomatic arch. However, in cases of comminuted arch fractures, open reduction and internal fixation are necessary. Early complications may include bleeding, infection from a haematoma, oedema, and transient nerve injury. Long-term complications may include hair loss, visible scarring, irreversible facial nerve paralysis, and depression of the temporal fascia [7]. Mizuno A et al., found that a pre-auricular incision successfully exposed the malar arch in 16 patients in their study. This procedure offers excellent stability to the fractured arch, precise mobilisation of fracture fragments, and prevention of excessive stretching of nerve fibers [8]. However, concerns regarding operative duration and the risk of nerve injury are significant with this method. Thangavelu A et al., recommended a fronto-temporal approach for managing zygomatic complex fractures [9].

The deep subfascial technique was performed by Rowe NL in which the plane underneath both layers of the temporalis fascia was dissected [10]. Al-Kayat and Bramley modified the standard pre-auricular approach for a child with bilateral long-standing ankylosis by performing a similar deep subfascial dissection because it was necessary to cut through the combined layer of the temporal fascia to reach the malar arch [5]. This method is recommended for all Temporomandibular Joint (TMJ) operations, including ankylosis and the zygomatic arch, and is highly recommended for follow-up procedures in the temporal area and TMJ. It is also recommended for repairing post-traumatic deformities of the zygomatic arch and complex [2]. The deep subfascial approach is based on different anatomical planes that are easily recognised during surgery, making the procedure straightforward and simple to apply.

CONCLUSION(S)

The deep subfascial approach has been shown to be a safer surgical treatment in terms of facial nerve injury compared to the standard subfascial approach, although long-term follow-ups have shown minor differences between the approaches. The deep subfascial approach preserves and protects facial nerve branches. In the present case, the fractured portion was successfully reduced with minimal post-operative discomfort, and function was restored.

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PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: May 09, 2023
- Manual Googling: Jun 16, 2023
- iThenticate Software: Jul 26, 2023 (18%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **May 08, 2023**
Date of Peer Review: **Jun 10, 2023**
Date of Acceptance: **Jul 31, 2023**
Date of Publishing: **Sep 01, 2023**