Journal of Surgery
2021; 9(6): 252-255
http://www.sciencepublishinggroup.com/j/js
doi: 10.11648/j.js.20210906.11
ISSN: 2330-0914 (Print); ISSN: 2330-0930 (Online)

Classification and Clinical Significance of Traumatic Posterior Cranial Fossa Fractures

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To cite this article:
Zhang Yanping, Zhang Pan. Classification and Clinical Significance of Traumatic Posterior Cranial Fossa Fractures. *Journal of Surgery*. Vol. 9, No. 6, 2021, pp. 252-255. doi: 10.11648/j.js.20210906.11

Received: September 28, 2021; **Accepted**: October 19, 2021; **Published**: November 5, 2021

Abstract: *Objective* To explore the classification and efficacy of traumatic posterior cranial fossa fractures. *Methods* 155 cases were diagnosed by CT examination to determine for traumatic posterior fossa fracture involving the wounded and merger, at the same time will find traumatic cerebellopontie angle syndrome, as one of the key content classification, GCS score 3 to 15 points, and according to the clinical symptoms and signs combined with CT examination put forward the new classification, through the selection of parting early surgical and non-surgical treatment. *Results* 155 cases of posterior cranial fossa fracture and its associated injury were classified into type I-VI, and the therapeutic effect was evaluated according to GOS score after 6 months follow-up. Among the 75 cases, 50 cases were treated with 5 points, 16 cases were treated with 14 points, 5 cases were treated with 3 points, 2 cases were treated with 2 points, 2 cases were treated with 1 point, and the rest 80 cases were treated without operation with 4-5 point. *Conclusion* The new classification of type I-VI proposed by our group and the selection of ultra-early surgical and non-surgical treatment according to the classification are the key to reduce the mortality and disability rate in this study. Especially, the traumatic cerebellopontine angle syndroma proposed by zhang yan ping that important significance of timely operation.

Keywords: Traumatic Fracture Classification, Posterior Cranial Fossa, Traumatic Cerebellopotinte Angle Syndrome, Surgical Treatment

1. Introduction

There were accountion 5% in the fracture of posterior cranial fossa [1]. But early clinical manifestations of posterior cranial fossa fracture caused by occipital injuries are not typical, and the injury changes rapidly, and the complicated injury is often fata, if association with longituding fracture of the clivus secondery the basilar artery injury, or foramen magnum fracture secondery medulla oblongata injury [2, 3], so the fatality rate is high [4]. At present, there has been no report on early surgical treatment of fracture and involved injury at this site by classification method at home and abroad, especially the syndrome of posttraumatic cerebellopotinte angle is a new discovery. A total of 4013 patients with craniocerebral injury were admitted to our department from July 2010 to December 2020 (including sosme cases before 2000), among which 155 cases were posterior cranial fossa fracture, accounting for 3.7%. We divided them into I-VI type in order to improve the early diagnosis rate and treatment success rate of such injury, and reduce the rate of sudden disease.

2. Clinical Data

2.1. General Data

Among the 155 cases, 125 were males and 30 were females, aged 20-60 years, with an average age of 45 years. Cause of injury: 126 cases of impact injury caused by car accident, 18 cases of fall injury, 11 cases of impact injury. The points of impact were all in the external occipital tuberosity and its vicinity.

2.2. Diagnosti Criteria for Posterior Cranial Fossa Fractures

Abrasions or subcutaneous hematoma in the occipital area;

With or without traumatic cerebellopontine angle syndrome;

Severe and strong parietal pain, forced head position, unclear speech;

Cardiopulmonary insufficiency or respiratory arrest;

Fracture line on CT or X-ray;

With or without cerebrospinal fluid leakage and posterior circulation vescular injury.

2.3. Classification of Posterior Cranial Fossa Fractures

Type I: CT scan of unilateral squamous or condylar or bilateral squamous and condylar fractures of the occipital posterior fossa, with fracture line extending and posterior margin of the foramen magnum. There are two subtypes of AB, Type A fracture with traumatic pontine foot syndrome; Type B was associated with frontal pole or frontotemporal pole contusion and intracerebral hematoma.

Type II: Oblique fracture with fracture after CT scan. Internal auditory canal fracture. There are three subtypes of ABC, type A fracture with intracranial hematoma; Type B fracture with severe temporal brain contusion and vascular injury, type C fracture with cerebral nerve injury.

Type III: CT scan of anterior base fracture of posterior fossa with sphenoid fusion fracture. There are two subtypes of AB: type A fracture with pons injury and type B fracture with basilar artery injury.

Type IV CT scan of posterior fossa invovlve the temporal bone mastoid fracture and herr word indole or parietal occipital fracture. There are two subtypes of AB, type A fracture with riding epidural hematoma, type B fracture with frontal pole cerebral contusion and fluid accumulation.

Type V CT scan of fractures at the anterior and posterior margins of the foramen magnum of the posterior fossa. There are two subtypes of AB, type a fracture with medulla contusion and type B fracture with hypoglossal nerve injury.

Type VI CT scan of mixed complex posterior fossa fractures. There are two subtypes of AB, type A fracture with traumatic cerebellopontine angle syndrome, and type B fracture with acute intracranial hematoma or high cervical spinal cord injury.

2.4. Patients Classification and Clinical Manifestations

There were 62 cases of type I, including 55 males and 7 females. All of them were blunt and percussive injuries to the posterior occipital region, belonging to subtype A, including acute epidural hematoma in the posterior fossa in 17 cases, subacute epidural hematoma in 3 cases, delayed intracerebellar hematoma in 4 cases, cerebellar hemispheric contusion with subacute small hematoma in the angle of cerebellar pontine in 7 cases, 3 of them with acute subdural and delayed intracerebellar hematoma in the upper right side. All 28 cases were subtype B with frontal pole contusion or laceration. Symptoms and signs: All the 10 patients had a history of transient coma after injury. Patients with supratentorial intracranial hematoma could have sustained coma and progressive dilation of pupils on one side. Postoperatived, Patients with delayed intracerebellar hematoma on the same side had brain stem compression and high cranial pressure. There were 12 cases associated with progressive disturbance of consciousness, headache, nausea, vomiting, respiratory failure or sudden arrest in a short period of time and 10 cases of cerebellar hemispheric contusion with space hematoma of intracerebellopotine angle accompanied with syndrome, and 30 cases of frontal pole contusion or lacerration associated with different degree of mental disorder. All patients had occipital swelling and skin rubbing.(Sample number to be proofread).

There were 45 cases of type II, including 42 males and 3 females, mainly with blast injury, which belonged to subtype A, including 13 cases of subdural hematoma with temporal lobe destruction injury. In subtype B surgery, 4 cases were associated with basal sinus injury and 3 cases were associated with carotid artery injury in rock bone segment and brain contusion. 25 cases belonged to subtype fracture. Symptoms and signs: 13 patients with acute subdural hematoma and temporal contusion were in coma for a long time, and 6 patients had dilated and fixed bilateral pupils and no response to light. Signs of tentorial tangential hernia in 7 cases. Among the 8 cases, 4 cases had basal sinus injury and 4 cases had internal carotid artery injury in rock bone segment, mainly presenting with shallow coma and unstable hemorrhagic vital signs. The other 7 cases had facial, auditory and abducens nerve injury in the early stage of simple fracture, and the other 4 cases had facial injury to varying degrees after awakening. Auditory nerve injury and cerebrospinal fluid leakage.

There were 17 cases of type III, including 12 male and 5 female, all of which were the offset injury of temporal force, mostly without intracranial hematoma, often accompanied by pontine contusion, snow in sphenoid sinus,and sometimes accompanied by basilar artery and its branches spasm. Symptoms and signs: coma or hazy state immediately after injury, restlessness, bilateral pupil narrowing, weak light response, accompanied by glossopharynx, vagus. Symptoms of accessory and sublingual nerve injury, increased muscle tension of limbs, bilateral Babiskin positive, severe cases can appear acute respiratory and circulatory failure.

There were 14 cases of type IV, including 9 males and 5 females, all of which were of occipital force. Subtype A included acute riding epidural hematoma in 7 cases, subtype B included 4 cases complicated by subarachnoid hemorrhage and 3 cases complicated by subdural effusion, among which 7 cases were complicated by mild local contusion and laceration of temporal base brain. In other cases, the frontal pole injury at the hedge site was not obvious. Symptoms and signs: all the 14 patients had a history of coma after injury, among which 7 patients had typical intermediate awake stage, followed by oculomotor nerve crisscross paralysis, 5 patients were awake with strong muscles, and the remaining 2 patient had signs of ocular and facial auditory nerve injury and cerebrospinal fluid otorrhea. Swollen and purple behind ears and occipital area.

Among 7 patients with type V, there were 6 males and 1 female, bilateral suboccipital crush injury, coma immediately after injury accompanied by respiratory arrest in 4 cases, respiratory arrest in 1 case, strike injury in suboccipital area in 1 cases, and post injury in 1 case Coma.

signs and symptoms: 2 cases of early main show is respiratory dysfunction and cardiac arrest after injury, hypoglossal nerve palsy in 3 case, accompany side limb paralysis, the rest cases 2 h foramen magnum hernia after injury and unstable vital signs, 2 cases of mind qing with limited neck movement significantly, with lower limbs muscle power and muscle tension.

All the 11 cases of type VI had coma and fracture history after injury, including fracture of hermeneutic suture, fracture of occipital scale, condyle and anterior base, etc. The fracture was serious and involved in a wide range, and most of the fractures were in the pontine extension, which had a large image on the respiratory circulation center, accompanied by single or more diffuse hemorrhage or small hematoma in the pontine angle. Symptoms and signs: 6 of the 11 patients presented with pontocerebellopotinte angle syndrome and 5 with oculomotor nerve crossing paralysis, all of which had local swelling and cyan, indicating unstable signs.

3. Treatment and Results

In this study, 75 patients with type I-VI underwent surgical treatment under intubation general anesthesia, among which 5 of 27 patients with type I underwent supratentorial and subatentorial craniotomy, 12 of 13 patients with type II underwent supratentorial and subatentorial craniotomy, 10 patients with type III and 9 patients with type IV underwent supratentorial and subatentorial craniotomy, 7 patients with type V and 9 patients with type VI underwent posterior fossa craniotomy, hematoma removal and decompression were performed, respectively. Among them, 3 patients underwent bilateral standard modified pterion approach, 5 patients underwent frontal drilling and drainage in the emesrgency ward, namely, removal of subdural hematoma in the temporal region and intracerebellar hematoma through the subatentorial median approach, and 4 patients only received drainage, followed by emergency posterior cranial fossa decompression. All cases of acute airway obstruction were treated with tracheotomy. All patients were hospitalized in NICU after operation, only 4 cases died, 71 cases achieved good clinical effect. The 80 cases without operation were treated with dehydration and neurotrophic sdrugs. All achieve good results.

4. Discussion

4.1. Traumatic Cerebellopontine Angle Syndrome

This traumatic cerebellopontine angle syndrome was first proposed by the author Zhang Yan ping [5], and was found according to the pathophysiological process of clinical posterior cranial fossa fracture injury and its associated injury. Since then, this kind of clinical patients have been observed for a long time, although the incidence is low and can occur from time to time, and is of great significance for diagnosis and treatment. However, the basis of its formation is closely related to the anatomical characteristics of cerebellopontine angle. The triangular gap formed by the pontine as the inner boundary, the petrosal as the anterolateral boundary, and the cerebellum as the posterolateral boundary is called the pontine Angle [6]. It's a tight space with important brain nerves running through it. According to the clinical observation of type 1 and type VI posterior fossa fractures involved in this study, subacute hematoma, edema and even local circulation disturbance of cerebrospinal fluid can occur when the comminted fracture in the occipital region impinges into cerebellar parenchyma, resulting in fracture of cerebellar parenchyma or accompanied by injury of terminal branch of anterior inferior cerebellar artery. The triangular space slowly forms a space occupying change, and the early clinical manifestations are dizziness, vertigo, tinnitus hearing loss, facial numbness, nystagmus and vomiting or swallowing difficulties. This is related to hearing, face, glossopharynx. This study called traumatic cerebellopontin eangle syndrome [7]. This syndrome is the clinical specific diagnostic basis of posterior cranial fossa fracture, involved injury and associated injury in our group, and is very important for timely surgical treatment.

4.2. Classification and Treatment

Becauese of the posterior fossa fracture association with epidural hematoma, subduralhematoma and intracerebral hematoma were an uncommon but grave serious complication of head trauma, which is induce foramen magnum hernia [8-10]. But the group patients with same complications. Thererfore, Line 75 cases of surgery anesthesi intubation posterior fossa hematoma removal and decompression, the mode I fracture complicated with more than 15 ml epidural hematoma volume, type II fracture with hematoma and the extremely serious contusion or temporal bone segments with rock internal carotid artery injury, VI type of bone fracture complicated with straddling hematoma or sag, v-shaped fracture is feasible posterior incision line for the foramen magnum decompression, part IV fractures in patients with rescue opportunity, should be a race against time, the surgery, try our best to treat. Patients with traumatic pontocerebellar foot syndrome were treated with surgery. Type III is mostly non-operative. Type I, II. VI, V, IV in addition to the above surgical indications, that rest non-surgical treatment of dehydration, anti-inflammatory and brain protective agents was performed.

4.3. Classification and Recovery

All 155 cases achieved good results according to GOS score after treatment, and the fatality rate was 0.39%, which significantly reduced the rate of disability and fatality that consistent with for the other document reported [11].

Life threatening of medulla oblongata injury in magnum foramen fracture. This was because the treatment method was selected through classification, both patients requiring surgery and non-surgery were treated in time.

5. Conclusion

The Group of 155 cases with fracture of posterior fossa and involving the wounded merger according to the injury mechanism, clinical symptoms and signs are closely combined with imaging examination, I - VI type classification method was proposed, at the same time traumatic cerebbrallopontine angle syndrome was important role that in classification treatment, through the selection of parting timely surgical and non-surgical treatment, Which significantly reduced the disablement rate and case fatality rate.

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