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Neurosurgery

TREATMENT STRATEGY & OUTCOME IN BASIFRONTAL CONTUSION- ANALYSIS OF 76 CASES

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ABSTRACT

Background: Cerebral contusions involving the inferior frontal lobes (Basifrontal region) are important from the management point of view as sudden deterioration can occur in such patients at any point of time during the course of treatment.

Objective: The purpose of this study is to assess the outcome in patients with basifrontal contusions & compare the conservative vs. surgical treatment in patients presenting with smaller contusions and moderate Glasgow coma scale score(GCS).

Material & methods: The clinical course of 76 head injury patients in whom CT had shown basifrontal contusion admitted between June 2011-May 2013 to our hospital, were retrospectively analyzed.

Results: Early intervention was done in nineteen patients of which 10 patients having contusion volume >50cm^3 and 9 patients having contusion volume > 35cm^3< 50cm^3 with GCS score of 6-8. Twenty-eight patients (nine patients with unilateral lesion & nineteen patients with bilateral lesions) were seen having increase in contusion volume & were undergone delayed surgical intervention after 48 hours. Fourteen patients died of which three deaths were observed in post op period & all of them were undergone delayed operation after repeat CT scan. Seven patients died due to rapid deterioration within 24 hours of admission having GCS 13 to 15 with contusion volume 20cm^3 – 35cm^3. Four patients died after 7 days with GCS 9-13 who were conservatively managed with contusion volume < 20 cm^3. Both sudden & delayed deterioration complicated the clinical course of this disease with both increased mortality & morbidity in bilateral lesions.

Conclusion: The management of a patient with basifrontal contusion is more difficult than a patient with contusions of other area of brain & intracranial hematomas as the basifrontal region is a silent area of brain and the quantum of injury, features of raised intracranial pressure are not clinically evident.

KEYWORDS : Contusion, Basifrontal, Early & delayed, Surgical intervention

INTRODUCTION

Cerebral contusions frequently involve the inferior frontal lobes (Basifrontal region) where the brain tissue comes in contact with the irregular bony surface of the anterior cranial fossa due to the relative motion of the brain & skull at these sites. These are dynamic lesions that evolve with time which may show progressive or sudden deterioration. Sudden deterioration is especially seen in this region & more so when the lesions are bilateral. These lesions are important from the management point of view as sudden deterioration can occur in such patients at any point of time during the course of treatment as the lesions are in the same axis & their close proximity to the brainstem. Patients with these lesions were managed either conservatively or surgically taking into account the size of the contusion, signs of mass effect on radiological basis & neurological status at the time of presentation. The purpose of this study is to assess the outcome in patients with basifrontal contusions & compare the conservative vs. surgical treatment in patients presenting with smaller contusions and moderate Glasgow coma scale (GCS) score.

MATERIAL & METHODS

The clinical records of all patients with traumatic brain injury(TBI) having only basifrontal contusion confirmed by Computed Tomography (CT) scan admitted between June 2011-May 2013 to our hospital, were retrospectively analysed. All the patients were transferred from the emergency department after initial resuscitation.

Initial decision for conservative or surgical intervention was taken on the basis of guidelines described in Text book Youmans Neurological Surgery (6th edition) [1]. Early surgery was done in patients with contusion volume > 50 cm3 regardless of GCS or frontal contusion greater than 20cm^3 with a midline shift of 5mm or cisternal compression in CT scan withGCS 6-8. Rest of the patients were observed with conservative treatment. Surgical management done were (1) Bifrontal-decompressive craniectomy with contusectomy and lax duraplasty, (figure 1& 2)(2) Bifrontal craniotomy leaving a strip of bone over the superior sagittal sinus with contusectomy and lax duraplasty (figure 3&4), (3) Unilateral frontal craniotomy with contusectomy and lax duraplasty (figure 5, 6). The surgical procedure adopted was according to the radiological features & surgeon's discretion. The patients with age > 70 yrs, penetratinginjury, brainstem injury, hemodynamic instability, other associated injuries and history of prior neurologic disease or disability were excluded. Invasive intra cranial pressure (ICP) monitoring was not done & instead repeat CT scan was done in patients showing neurological deterioration (Decrease2 points in GCS) or not showing neurological improvement within 48 hrs.Delayed surgery was done in patients whose repeat CT showed increased in contusion volume 35 -45 cm^3.

The following clinical parameters were recorded – demographic data, time from injury to primary surgical intervention, preoperative GCS, unilateral/bilateral lesion, mechanism of injury,time of deterioration, and Glasgow outcome score at discharge. Preoperative non-contrast CT scans were reviewed for contusion volume, associated lesions like subdural hemorrhage, subarachnoid hemorrhage, mass effectand midline shift. Postoperative CT scans were reviewed for any residual contusion, mass effect or midline shift. Post-operative complications, duration of hospital stay and GCS at discharge werealso recorded.

RESULTS

There were total 688 patients of brain contusions of different region who were treated in this period out of which 76 patients having only basifrontal contusion included in the study. Majority of the patients were in the age group of 40 – 49 yrs followed by 20 -29 yrs. The commonest mode of injury was fall from moving vehicle in 48(63%) patients followed by pedestrian hit by moving vehicle in 14(18%) patients, fall from height in 10(13%) patients & assault in 4(6%) patients.Bilateral basifrontal contusion was encountered in 49 patients whereas unilateral lesion in 27 patients. [Table - 1]. The male to female ratio was 4.8:1(Table -2). Early intervention was done in 19 patients of which 10 patients having contusion volume >50cm^3 and 9 patients having contusion volume > 35cm^3< 50cm^3 with GCS score of 6-8. The time from injury to primary surgical intervention ranged from 8 hrs to 23 hrs in these cases.Repeat CT scan was done in 40 patients showing neurological deterioration (↓ 2 points in GCS) or not showing neurological improvement within 48 hrs. Out of these 40 patients,28 patients(9 patients with unilateral lesion & 19 patients with bilateral lesions) were seen having increase in contusion volume & were undergone delayed surgical intervention.Total 14 deaths (4 patients with unilateral lesion & 10 patients with bilateral lesions) were observed of which 3 deaths were observed in post op period & all of them were undergone delayed operation after repeat CT scan. Seven patients died due to rapid deterioration within 24 hours of admission

having GCS 13 to 15 with contusion volume 20cm^3 – 35cm ^{3}. Four patients died after 7 days with GCS 9-13 who were conservatively managed with contusion volume < 20 cm^3. The average hospital stay was 10 days in patients having unilateral lesions & 14 days in patients having bilateral lesions. Good outcome (with GOS 4 & 5) was observed in 42 patients & poor outcomes in 20 patients (with GOS 2 & 3).

DISCUSSION

Contusions are zones of cellular injury where the microvasculature is also disrupted. The contused area becomes an amalgam of blood and necrotic brain, the so-called 'hemorrhagic contusion' [2]. Cerebral cortical contusions are the most common computed tomographic (CT) finding in head injured patients, but only few need operative treatment [3]. Nevertheless,in 2% of fatal head injuries only contusions are found at necropsy [4].Since most of the brain contusions are of small size, they do not require surgery but larger contusions with mass effect may cause secondary brain injury leading toneurological deterioration.

Anterior skull base is frequently injured following head injuries & brain contusions are common sequelae of traumatic brain injury (TBI) at this area. Cerebral contusions are dynamic lesions that evolve with time which may show progressive or sudden deterioration. Sudden deterioration is especially seen in basifrontal region & more severe when the lesions are bilateral [1].Seven of our patients died due to sudden deterioration (< 24 hrs of admission) who was admitted with GCS 14/15.This may be because shift (progression of contusion) is antero-posterior rather than lateral, so that the classical “warning” lateralising signs develop very much later[3].

It is recommended that patients with GCS 8 or less, contusion greater than 20 cm^3, midlineshift of 5 mm or more, cisternal compression on CT scan and any lesion greater than 50 cm^3 must be treated surgically. [5,6]Likewise we have operated 19 patients who are fitting into these criteria but 40 patients who were having lesser contusion volume & better GCS, later clinically deteriorated out of which 28 patients had undergone delayed operation due to increase in contusion volume radiologically. Thus we will emphasize early surgical intervention in basifrontal contusion with volume of 20cm^3 - 35cm^3 regardless of GCS (in contrast to 50cm^3).This is particularly true when ICP monitoring, enough ICU back up & proper monitoring of patients in wards for conservative management are not possible.The patients most likely to develop raised ICP are those with extensive bi-frontal contusions, but an ICP of less than 30 mm of Hg in the first few days after injury does not exclude later deterioration [3]. Four of our patients died after 7 days, therefore if ICP monitoring is used, it may be needed for several days which increase the risk of complications.

Some authors describe a less invasive predictor of the patient's clinical course with quantitative blood flow determination by Xenon enhanced CT in GCS greater than eight to prevent clinically undetected deterioration from central herniation [7].

The incidence of expanding hematoma/contusion was 16.4% in a series by Yadav YR et al [8] while it was 42.3% in Oertelseries [9] and (68.2%) in Lobato[7] series. In our series the incidence of expanding contusionwas 36.8%.The most probable risk factors for delayed hematomas are coagulopathy, presence of pre-existing intracerebral contusion / hematoma, traumatic vessel injury, subdural hematoma and development of hematoma after treatment of raised intracranial pressure are described [11&12].Brain swelling in a contused area is commonly seen and is often a common cause of neurological deterioration leading todeath. There are three phases of brain swelling due to contusion. The ultra-early phase occurs within first 24 h and is often the cause of clinical deterioration or death. The second phase occurs after 24-72 hrs and progresses for 7-10 days. [13]

The standard surgical treatment for hemorrhagic contusionis craniotomy with evacuation of contusions. But this procedure is less effective when brain injury is diffuse and with severely raised intracranial pressure resulting from brain oedema [14-15]. Decompressive craniotomy is a better option in comparison to limited craniotomy with lesion evacuation to reduce raised intracranial pressure in these patients [16,17]. Moreover, brain lobectomy or contusectomyalong with decompressive craniotomy is a useful adjuvant in the management of severe head injury with contusion larger than 20 cm^3. Aggressive management of brain contusion can lead to better outcome[18].

Bilateral lesions deteriorate more often than unilateral ones[1]. Similarly, in our series 19 patients with bilateral lesions deteriorated and had to undergo delayed surgical intervention in comparison to 9 patients with unilateral lesion.The mortality rate was 18% (14/76) which was more in patients with bilateral lesions (10/14). The average period of hospital stays was10 days in patients having unilateral lesions & 14 days in patients having bilateral lesions[Table - 3].

CONCLUSION

The management of a patient with basifrontal contusion is more difficult than a patient with contusions of other area of brain & intracranial hematomas as the basifrontal region is a silent area of brain and the quantum of injury, features of raised intracranial pressure are not clinically evident. These lesions always need special attention as sudden & rapid deterioration is the rule if intervention is not undertaken in proper time.Prompt and early recognition of the signs of deterioration, decision for early intervention (contusion with volume 20cm^3 - 35cm^3) regardless of GCS can help improve the outcome in such patients.Bilateral cases are more prone for clinical deterioration & poor outcome than unilateral lesions.

TABLE 1
Clinical characteristics of 76 patients

Characteristic	No. of Patients
Neurological condition	
Admission GCS score	
3–8	10
9–12	26
13–15	40
Mode of injury	
Fall from moving vehicle	48
Pedestrian hit by moving vehicle	14
Fall from height	10
Assault	4
Side of lesion	
Bilateral	49
Unilateral	27
Contusion Volume	
< 20 cm^3	24
> 20cm^3< 35cm^3	28
> 35cm^3< 50cm^3	14
>50cm^3	10

Table – 2: Relationship of age & sex distribution among patients

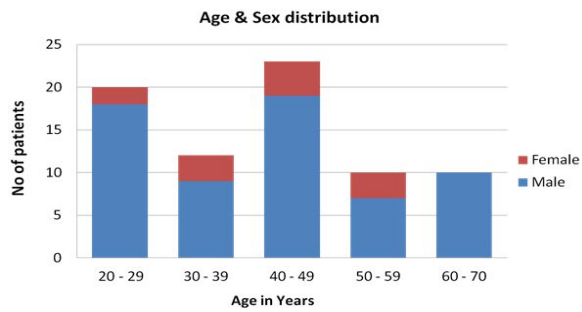

Table – 3: Summaryof treatment in unilateral / bilateral lesions

		Unilateral	Bilateral
GCS on Admission	13 -15	15	25
	9 -12	9	17
	3 - 8	3	7
surgery	Early	0	19
	Delayed	9	19
Length of stay(avg)		10days	14 days
Death		4	10
GOS	5	9	16
	4	7	10
	3	6	9
	2	1	4

Figure -1: Pre – op CT scan showing bilateral basifrontal contusion

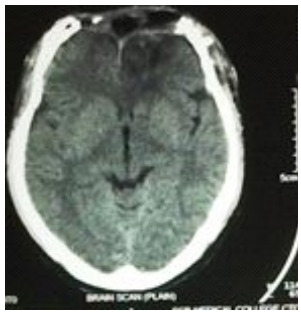

Figure -2: Post – op CT scan showing bifrontal decompressive craniectomy with contusectomy and lax duraplasty

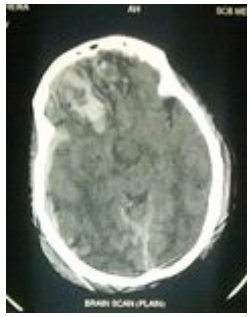

Figure -3: Pre – op CT scan of another patient showing bilateral basifrontal contusion

Figure - 4: Post – op CT scan of the same patient with 3D reconstruction of skull showing bilateral frontal craniotomy with a strip of bone in the midline protecting the superior saggital sinus

Figure -5: Pre – op CT scan showing right side basifrontal contusion

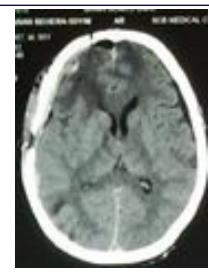

Figure -6: Post – op CT scan of the same patient after right frontal craniotomy & contusectomy

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