ORIGINAL ARTICLE

Outcomes of Conventional Craniotomy under Local Anesthesia in Traumatic Brian Injury Using Peer Regimen

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ABSTRACT

Objective: To see the efficacy or safety of managing traumatic brain injury under local anesthesia.

Study Design: Retrospective cohort study.

Place and Duration of Study: Department of Neurosurgery, Liaquat University Hospital Hyderabad from 1st December 2017 to 31st December 2018.

Methodology: Ten patients of all males between 20 to 55 years of age were included. The data was collected from the patients that went through emergency surgery or showed drop of more than three GCS. The data was collected through questionnaire based approach in three phases of whole time duration .i.e. preoperative, post operative with three month follow up.

Results: The extra-dural hematoma (80%) and combination of extra-dural hematoma with acute subdural hematoma (20%). Improvement of GCS from initial moderate to severe GCS (90%), improvement of non-radiological vitals, systolic blood pressure (70%), heart rate (90%), respiration rate (80%), eye pupil size (70%), improvement of neurological deficit (33%) with improvement in radiological variables, midline line shift reversal (100%), removal of hematoma (100%), improvement in volume on scan (100%) and reversal of Cisterns and sulci (100%). Post-operative complication includes iatrogenic pnemocephalus (100%), new hematoma or contusion (10%) and ischemia or infarct (20%) which was resolved within 5 to 7 days post operatively .i.e. pnemocephalus (90%), hematoma (100%) and ischemia or infarct (50%) with total of (90%) clinical and functional outcome. At the time of discharge, headache (50%), numbness (20 %), pain at surgical side (70%) and vertigo (50%), which were subsequently improvement of headache (100%), numbness (100%), pain at surgical side (57%) and vertigo (50%) due to conservative management up to three month follows up.

Conclusion: Conventional craniotomy under local anesthesia should be initial approach for early relive in extra-dural hematoma with or without acute subdural hematoma.

Key words: Outcome, Conventional craniotomy, Traumatic brain injury

INTRODUCTION

High concerns regarding traumatic Brain Injury, its mortality and morbidity, seems to be the Global public health issue with estimation of 57 million hospitalization with 108 to 332 new cases per 100,000 population per year on country based incidental range, 10 million or average of 39% severe enough to die from injury annually with 60% unfavorable GCS outcome.[1-3] An incidental rise in low and middle income countries which seems to be a leading cause of brain damage in children and young individuals which can subsequently leads to mental and physical disabilities either temporary or permanent with eventual death, estimation is by the year of 2020, it will surpass other leading cause of mortality and morbidity.[3-5]

Concerned outcome shows decrement in mortality curve over last decade through early prevention of secondary brain injury, targeted resuscitation and early specialist management in crucial periods besides senescence and Warfarin use, appear to an independent factor of poor outcome.[5-9] Severe Traumatic brain injury needs early neurosurgical intervention in one third of patients with 90% mortality associated with Acute Subdural Hematoma if evacuation is performed >4 hours after primary impact.[2] Decompressive craniectomy is much beneficial treatment option for head trauma but the pendulum of conflicts regarding its indication and procedure is still controversial besides it also resides unsatisfactory long term outcome.[8-11]

Other surgical modality like hinge Craniotomy reduces the need of cranioplasty in patients undergoing surgical cerebral decompression but it requires general anesthesia for anesthetic and analgesic purposes.[7,12] As defined prerequisite measurement for general anesthesia in intracranial surgery, which is somewhat different from other surgeries because both anesthesia and surgery often have very profound effect upon medullary centers and predispose the patient to additional risks like hypotension, these risks increase in proportionate, if the presence of other co-morbidities like hypertension, Diabetes, cardiac arrhythmia and chronic pulmonary disease associated with Traumatic brain injury.[7,13-15]

As an emergent condition to prevent the opening of death casement by Injury, the emergent and bold procedures need to be come up if purity of Hippocratic Oath needs to reside deeply inside. As in undeveloped countries, where the lack of advance resources is profound and high inflow of young brains with injury needed to be resolved by some other conventional approach like Peer Regimen.[16,17] The patient tolerance of craniotomy performed under local anesthesia and showed the safety for resection of lesions involving cortex as well as recently two studies reported the management of extra-dural hematoma and acute subdural with extra-dural hematoma under local anesthesia with conventional Craniotomy following Peer Regimen and shows good recovery of patients post operatively.[16-18]

MATERIALS AND METHODS

This retrospective cohort study was conducted in Neurosurgical Department at Liaquat University Hospital Hyderabad from 1st December 2017 to 31st December 2018. Radiological findings of midline shift > 5mm, age between 20-55 years, GCS drops in 3 or more within first 12 hours, co-morbidities, cases of extra-dural hematoma, ASDH or both and traumatic emergency were included. The data was collected through evaluation of patient in three phases through questionnaire based approach initially or during hospital stay then followed up for three months from the discharge of patient.

Preoperative phase: Total number of 10 patients (all males) with traumatic brain injury underwent conventional craniotomy under local anesthesia to control the raised intra-cerebral pressure. On admission, the initial GCS with vitals was assigned by the evaluating neurosurgeon present at that time frame, after initial evaluation and resuscitation, cranial CT scan is obtained to establish the proper diagnosis. After completing the diagnostic procedure and standard protocols, emergency surgery with general anesthesia had been planned, however certain conditions that make patient unfit for surgery like Co-morbidities or unavailability of anesthetics due to commitment of them with other emergency procedures, the intervention were postponed initially but drop of more than three or more points on GCS made the situation necessary to operate as soon as possible.

Operative procedure: With Patient under local anesthesia, using peer regime, at first 2% Xylocaine with adrenaline was used at the time incision on cutaneous and subcutaneous tissue respectively. Two types of incisions were used either a large question mark skin incision or Sootar incision at a time. In addition to that, Nalbuphine 1 ampoule (10mg) mixed in one liter of normal saline was continuously administered to patient during the whole procedure. Before cauterization of muscle, infusion of Provas (paracetamol) 1gm had been added to opposite side for facilitation. An approximation of 12x15 cm bone flap is removed after retraction of Periosteum, through four burr hole conventional craniotomy by taking consideration of good bevelling, for the evacuation of extra dural hematoma. The wound has been sealed in layers by applying tack up sutures. Before the opening of Dura, Midazolam (2-5 mg) was given, which facilitated the opening of Dura without resistance in a pain free environment for the evacuation of underlying subdural hematoma. Complete evacuation of extra and subdural hematoma was achieved with primarily repaired Dura. Intra-operatively, patient had angry looking reddish brain and bleeder underlying Dura, which was coagulated by using Bipolar. After primarily repaired Dura, the bone flap was placed back and closed rest of the wound in layers.

Postoperative phase: Postoperatively, regular clinical monitoring of the patient was done using GCS and Cranial CT Scan in all patients on first POD, third and fifth day to assess the brain swelling, midline shift and other signs of raised ICP, additional pathological findings such as contusions or new hemorrhage. General complains which can be treated conservatively were noted on discharge and after three months of follow up the reassessment of complains was done to extract the pure outcome of study. The data was entered and analyzed through SPSS-22.

RESULTS

The initial presentation type of injury, mode of injury and site of injury, the Glasgow Coma Scale of fluctuation from initial presentation to the shifting of patient from emergency department or ward to operation table and preoperative recording of findings is shown in Table 1. The variables are divided into radiological and non radiological categories are shown. The improvement of GCS, heart rate, systolic blood pressure, respiratory rate and pupil size is significant. Besides improvement of neurological deficit is less in comparison. Improvement of GCS above it comatose level is highly significant of good outcome of surgery (Table 2). The GCS of patient preoperative and postoperative is shown in Figure 1.

Table 1: Demographic information of the patients (n=10)

Variable	No.	%
Type of injury		
EDH	8	80.0
SADH	-	-
Both	2	20.0
Mode of injury		
Fall	-	-
Assault	3	30.0
RTA	7	70.0
Site of injury		
Temporal	3	30.0
Parietal	4	40.0
Frontal	3	30.0
Glassgow coma scale		
3-5	4	40.0
6-9	4	40.0
10-13	2	20.0
Heart rate		
<60	10	100.0
60-100	-	-
>100	-	-
Systolic blood pressure		
<140	3	30.0
140-159	3	30.0
160-180	4	40.0
>180	-	-
Respiration rate		
<16	-	-
16-20	3	30.0
21-24	7	70.0
>24	-	-
Eye pupil		
Anisocoric	8	80.0
Isochoric	2	20.0
Neurological deficit		
Present	3	30.0
Absent	7	70.0
Midline shift		
Present	10	100.0
Absent	-	-

Most patient discharge between 5 to 7 days postoperatively, the assessment of them is evaluated by questionnaire based approach and repeated CT scans. The associated symptoms were noted in association with clinical examination (Table 3). The findings that were

present on post operative CT scans observed to be resolved on 5th or 7th postoperative scans, that is Iatrogenic pnemocephalus, new hematoma/ contusion. Resolve of ischemia or infarct in one patient and present of stable ischemia or infarct on other patient seems to be responsible of death in patient with respiratory failure (Table 4).

Table 2: Frequency of non-radiological and radiological variables

Variable	No.	%
Non-radiological information		
GCS		
3-5	-	-
6-9	-	-
10-13	1	10.0
14-15	9	90.0
Heart rate		
<60	-	-
60-100	9	90.0
>100	1	10.0
Systolic blood pressure		
<140	7	70.0
140-159	3	30.0
160-180	-	-
>180	-	-
Eye pupil		
Anisocoric	3	30.0
Isochoric	7	70.0
Respiration rate		
<16	-	-
16-20	8	80.0
21-24	1	10.0
>24	1	10.0
Neurological deficit		
Present	2	20.0
Absent	8	80.0
Radiological information		
Removal of hematoma		
Yes	10	100.0
No	-	-
Midline shift		
Present	-	-
Absent	100	100.0
Volume on scan		
Decrease	10	100.0
Preserve	-	-
Iatrogenic pnemocephalus		
Present	10	100.0
Absent	-	-
New hematoma		
Present	1	10.0
Absent	9	90.0
Ischemia/infarct		
Yes	2	20.0
No	8	80.0
Reversal of cisterns		
Yes	10	100.0
No	-	-

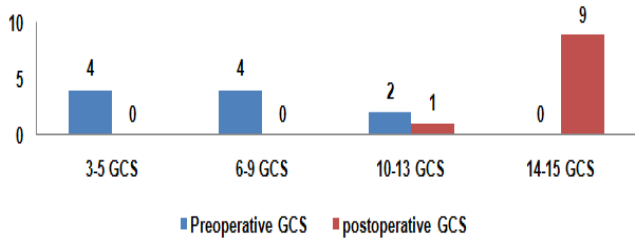

Fig. 1: Comparison of GCS

Table 3: Non-radiological findings between 5-7 days postoperatively (n=9)

Variable	No.	%
GCS		
3-5	-	-
6-9	-	-
10-13	-	-
14-15	9	100.0
Neurological deficit		
Present	-	-
Absent	9	100.0
Headache		
Present	5	55.5
Absent	4	44.5
Numbness		
Present	2	22.3
Absent	7	77.7
Pain at surgical side		
Present	7	77.7
Absent	2	22.3
Vertigo		
Present	6	66.7
Absent	3	33.3

Table 4: Radiological findings on 5th or 7th postoperatively

Variable	No.	%
Iatrogenic pnemocephalus		
Resolve	9	100.0
Present	-	-
New hematoma		
Resolve	1	100.0
Present	-	-
Ischemia/infarct		
Resolve	1	50.0
Present	1	50.0

After three months follow-up of each patient were undertaken, and repeated evaluation of associated symptoms that were present at the time discharge or any new occurrence of symptom were noted through questionnaire based approach (Table 5). The final outcome is shown in Table 6.

Table 5: Follow-up measurements at 3 months

Variable	No.	%
Headache		
Present	-	
Absent	9	100.0
Numbness		
Present	-	
Absent	9	100.0
Pain at surgical side		
Present	4	44.5
Absent	5	55.5
Vertigo		
Present	3	33.3
Absent	6	66.7

Table 6: Frequency of final outcome

Outcome	No.	%
Functional	9	90.0
Clinical	9	90.0
Death	1	10.0

DISCUSSION

Progressively increase in an incidence, mortality and morbidity with decrease life expectancy especially in low

income or developing countries due to traumatic brain injury is a major factor that pressing or raising the bars for developing countries to supervene its economical as well as health crises because of its consequences, that usually leads to disability, lost of productivity with increase burden of medical care and rehabilitation.[2,3,19] Despite the presences of Clinical practice guidelines, which showed to be effective in reducing mortality, optimizing clinical outcomes, decrement of medical cost and rehabilitation, the management of TBI still remains a challenging situation for neurosurgeons, anesthesiologist and intensive care staff.[7,20] Many advancements in the management such as ICP monitoring and multi-disciplinary approach are seems to be the major factors in decrement of such disastrous effect but compliance and presences of this factor is blurred in economical struggling countries.[7,21]

As an immediate nature, the outcome of severe traumatic brain injury usually depend upon the early surgical intervention, decompressive craniectomy or craniotomy is usually a preferred surgical options but after the DECRA and other trials, which showed worst outcome at 6 months, which produces the conflicts about its technique, timing and selection of patient.[22-25] Despite of their pros and cons, either of these surgeries required general anesthesia, which has its own effects on cerebral vascular physiology with dilemma of selecting anesthetic agent, despite craniotomy previously had been done for brain mapping, mini craniotomy for SADH under local anesthesia but conventional craniotomy for evacuation of extra-dural hematoma with or without acute subdural hematoma under local anesthesia was first reported in early 2017.[7,16-18,26]

From the series of this case reporting to the continuation of this study, evacuation of extra-dural hematoma with or without subdural hematoma shows promising of 90% healthy outcome with early regain to GCS, decrease period of hospital stay with decrease ICU admission, decrease postoperative late complication as compare to long term effect of craniectomy and Craniotomy but relatively small sample size of our study doesn't justify the real efficacy as compare to these studies.[23,24,27] Comparative and multi centric randomized control trail should be done to test the real efficacy of this procedure.

CONCLUSION

Increased safety and decreased danger of intervention with good outcome should be the initial approach for early relive in extra-dural hematoma with or without acute subdural hematoma, which by then should be managed accordingly to the flow of its consequences. This can be the magical procedure with relative or few complications or the modern treatment of Traumatic brain injury expect Contusions. Important consideration should be done on this approach with other multi-center or larger trials.

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