International Journal of Neurosurgery
2022; 6(2): 94-98
http://www.sciencepublishinggroup.com/j/ijn
doi: 10.11648/j.ijn.20220602.21
ISSN: 2640-1940 (Print); ISSN: 2640-1959 (Online)

Surgical Outcome of Expansile Duraplasty VS Multiple Dural Slits in Patients with Traumatic Acute Sub-Dural Hematoma in Terms of Glasgow Outcome Scale (GOS)

Nafees Ahmad Khan[1, *], Syed Arif Hussain[2], Umer Sajjad[3], Ghayur Abbas[4], Sajid Nazeer Bhatti[5]

[1]Department of Neurosurgery, Pakistan Institute of Medical Sciences, Islamabad, Pakistan

[2]Department of Neurosurgery, Provincial Headquarters Hospital, Gilgit Baltistan, Pakistan

[3]Basic Health Unit Khazana, Peshawar, Health Department, Khyber Pakhtunkhwa, Pakistan

[4]Department of Neurosurgery, University Hospitals Birmingham NHS Foundation Trust, Queen Elizabeth Hospital, Birmingham, UK

[5]Neurosurgery Department, Pakistan Institute of Medical Sciences, Islamabad, Pakistan

Email address:

dr.nafeeckhan@gmail.com (Nafees Ahmed Khan), drsyedarif333126@gmail.com (Syed Arif Hussain), umar.lrh@gmail.com (Umer Sajjad), ghayurabbas02@gmail.com (Ghayur Abbas), sajid-51@hotmail.com (Sajid Nazeer Bhatti)

[*]Corresponding author

To cite this article:

Nafees Ahmad Khan, Syed Arif Hussain, Umer Sajjad, Ghayur Abbas, Sajid Nazeer Bhatti. Surgical Outcome of Expansile Duraplasty VS Multiple Dural Slits in Patients with Traumatic Acute Sub-Dural Hematoma in Terms of Glasgow Outcome Scale (GOS). *International Journal of Neurosurgery*. Vol. 6, No. 2, 2022, pp. 94-98. doi: 10.11648/j.ijn.20220602.21

Received: August 8, 2022; **Accepted**: October 12, 2022; **Published**: October 29, 2022

Abstract: *Objective:* To compare the post-operative Glasgow Outcome Scale (GOS) of expansile duraplasty vs multiple dural slits in patients with traumatic Acute Sub Dural Hematoma. *Duration:* 20.11.2019 to 19.05.2002 (6months). *Setting:* Department of Neurosurgery, PIMS, Islamabad. *Subject and Methods:* The study design was a randomized control trial. A total of 70 patients presented to our department with traumatic brain injury (acute subdural hematoma) divided into two groups through the lottery method and meeting our inclusion criteria were enrolled through the nonprobability consecutive sampling technique. *Results:* Out of 70 patients, Group A (wide dural wide flap and duraplasty) was found in 15 (42.86%) patients, while Group B (multiple dural slits) was found in 04 (11.43%) patients (p-value=0.003). *Conclusion:* This study concluded that favorable outcome is better in such cases who underwent expansile duraplasty in patients with traumatic acute sub dural hematoma as compared to patients who underwent multiple dural slits in traumatic acute sub dural hematoma. Therefore, we recommend that expansile duraplasty should be used as a prime technique in patients with traumatic acute sub dural hematoma for favorable outcome in terms of Glasgow Outcome and to reduce the overall morbidity and mortality of our general population presented with traumatic brain injury (traumatic acute sub dural hematoma).

Keywords: Traumatic Brain Injury, Subdural Hematoma, Duraplasty, Expansile Duraplasty, Multiple Dural Slits, Glasgow Outcome Scale

1. Introduction

Traumatic brain injury (TBI) is considered one of the leading causes of mortality, morbidity, and socio-economic losses worldwide. TBI is sudden damage to the brain caused by a blow or jolt to the head commonly caused by road traffic accidents (RTAs), falls, sports injuries, and assaults [1].

Intra-cranial hematomas are the most dreadful consequences of TBIs, and out of them, acute sub-dural hematoma's (Ac SDH) are the most lethal, carrying very high mortality and morbidity. Ac SDH is the collection of fresh blood between the dura-matter and the sub-arachnoid layer of brain. Ac SDH can occur due to damage to surface cortical vessels or bleeding from an underlying parenchymal injury, or damage/tear of bridging veins from cortex to dural venous sinuses [2, 3].

The treatment goal of TBI is to reduce and prevent secondary brain damage. The pathologic increase in intra

cranial pressure (ICP) can compromise cerebral perfusion pressure (CPP), leading to fatal brain herniation syndrome and permanent neurological deficit [4].

The Ac SDH is the extra-axial, hyperdense, crescentic hematoma collection and occurs within 14 days of TBI. Motor vehicle accidents are the leading cause of Ac SDH in younger age groups (56%), followed by falls (12%), whereas in elder groups, a history of falls is the most common cause of Ac SDH (56%) [5].

CT Scan Brain is the most used investigation for diagnosis and treatment plan of Ac SDH. Various medical and surgical methods have been devised to treat Ac SDH. If the hematoma thickness is more than 10mm or if there is a 5mm midline shift, surgical evacuation of the hematoma should be done [5, 6].

Regarding the surgical evacuation of Ac SDH, there are various procedures like burr hole evacuation, craniotomy, and evacuation of hematoma and decompressive hemicraniectomy (DC). In DC, the skull bone (mainly the frontal, temporal, parietal, occipital bone, diameter>12cm) is removed, the bone flap is buried in the abdomen and either Expansile duraplasty or multiple dural slits (fenestrations) are made [2, 5].

In a recent study, Abdul Aziz Khan et al. reported that patients with low GCS on presentation (GCS<8) and multiple dural slits showed better post-op Glasgow Outcome Scale (GOS) by allowing slow evacuation of hematoma and fluids as well as simultaneously preventing the pounding and laceration of the brain. In contrast, in other techniques of wide dural opening and duraplasty, the pounding and laceration of the brain were not in control leading to secondary brain injuries (like hypoxia) and resulting in much more morbidity and mortality. According to the study, there were 12 (37.5%) patients in group A (wide dural opening followed by duraplasty) and 3 (9.4%) patients in group B (multiple dural fenestrations) who had favourable results (GOS: 4, 5) while in group A and group B, 20 (62.5%) and 29 (90.60%) patients had unfavourable result (GOS: 2, 3) [5].

In another recent study, Kalim Uddin et al., reported that multiple dural fenestrations are an effective decompressive procedure for removal of acute SDH as compared to wide dural opening with duraplasty. According to GOS group A (wide dural opening followed by duraplasty), there was 48% of patients with good recovery, moderate disability (16%), severe disability (08%), persistent vegetative state (04%), and 24% died. While in group B (multiple dural fenestrations), good recovery was 47.83%, moderate disability (13.04%), severe disability (4.35%), persistent vegetative state (13.04%), 21.74% died [7].

As there is not any local study in literature that has assessed the post-op outcome in terms of GOS of expansile duraplasty vs multiple dural slits in traumatic acute sub-dural hematoma patients, so the rationale of my study is to compare the surgical outcome of expansile duraplasty vs multiple dural slits in traumatic acute sub-dural hematoma's in terms of Glasgow Outcome Scale (GOS). The results of my study will not only modify the better treatment plan for this problem but will also set baseline data for both national and international levels. Moreover, the method with better results can opt routinely in our general practice to reduce our population's morbidity and mortality.

2. Methodology

This randomised control trial was carried out on 70 patients (35 patients in each group) through a nonprobability consecutive sampling technique. The study was performed at the Department of Neurosurgery, PIMS, from 20 November 2019 to 19 May 2020. All trauma patients presenting to ER, fulfilling the inclusion criteria, were enrolled in this study and were reviewed by a senior neurosurgeon for appropriate management. Written informed consent was taken from the patient. In group 'A', patients underwent craniotomy with wide dural wide flap and duraplasty, and in group 'B', patients were undergone multiple dural slits. Patients were observed in terms of the Glasgow Outcome Scale (GOS) for four weeks after surgery. Data was entered and analyzed using SPSS version 20. P value < 0.05 was kept significance.

3. Results

The age range in this study was from 15 to 60 years, with a mean age of 35.67 ± 9.78 years. The mean age of patients in group A was 34.91 ± 9.10 years, and in a group B was 37.11 ± 10.26 years. The majority of the patients, 42 (60.0%), were between 18 to 40, as shown in Table 1. Out of 70 patients, 47 (67.14%) were males, and 23 (32.86%) were females, with a male-to-female ratio of 2.16:1. Mean duration of trauma was 8.26 ± 2.28 hours (Table 2). The distribution of patients according to baseline GOS is shown in Table 3. Mean GCS was 6.78 ± 2.34. In my study, favourable outcome (GOS 4, 5) in Group A (wide dural wide flap and duraplasty) was found in 15 (42.86%) patients, while in Group B (multiple dural slits) was found in 04 (11.43%) patients (p- value=0.003).

Table 1. *Age distribution for both groups (n=70).*

Age (years)	Group A (n=35)		Group B (n=35)		Total (n=70)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
15-40	24	68.57	18	51.43	42	60.0
41-60	11	31.43	17	48.57	28	40.0
Mean ± SD	34.91 ± 9.10		37.11 ± 10.26		35.67 ± 9.78	

Table 2. *Distribution of patients according to the duration of trauma (n=70).*

Duration (hrs)	Group A (n=35)		Group B (n=35)		Total (n=70)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
≤6	08	22.86	08	22.86	16	22.86
>6	27	77.14	27	77.14	54	77.14
Mean ± SD	8.26 ± 2.28		8.26 ± 2.28		8.26 ± 2.28	

Table 3. *Distribution of patients according to baseline GOS (n=70).*

Baseline GOS	Group A (n=35)		Group B (n=35)		Total (n=70)	
	No. of patients	%age	No. of patients	%age	No. of patients	%age
2	19	54.29	19	54.29	38	54.29
3	16	45.71	16	45.71	32	45.71
Mean ± SD	7.06 ± 0.76		7.14 ± 0.73		7.09 ± 0.74	

Table 4. *Stratification of favorable outcome concerning age, gender, duration of trauma and baseline GOS (n=70).*

		Group A (n=35) favorable outcome		Group B (n=35) favorable outcome		P-value
		Yes	No	Yes	No	
Age (years)	15-40	11	13	02	16	0.016
	41-60	04	07	02	15	0.121
Gender	Male	11	13	03	20	0.014
	Female	04	07	01	11	0.104
Duration (hrs)	≤6	02	06	00	08	0.131
	>6	13	14	04	23	0.008
Baseline GOS	2	09	10	03	16	0.036
	3	06	10	01	15	0.033

4. Discussion

Decompressive craniectomy has been used as a treatment option for severe Traumatic Brain Injury (TBI) since 1971 [8]. Early outcomes of decompressive craniectomy were predictably poor, with high mortality and poor functional outcome rates in survivors [9, 10]. However, several studies report good outcomes and reduced mortality when decompressive craniectomy is performed early following traumatic brain injury [11, 12]. Other studies have demonstrated that clinical outcomes of decompressive craniectomy are worse in patients with poor Glasgow Coma Scale (GCS) scores (≤ 8 out of 15). Few studies have followed patients with TBI and a GCS score of 3 or 4 [13, 14]. Tien et al. [15] reported an overall mortality rate of 100% in patients with a GCS score of 3 who had fixed and dilated pupils. Cooper et al. [16] reported that decompressive craniectomy in patients with severe TBI and bilateral non-reactive pupils was associated with poor outcomes and death. Decompressive craniectomy has been avoided in patients with the most severe injuries (GCS score of 3 or 4) owing to poor outcomes and functional recoveries reported previously.

I have conducted this study to compare the post-operative Glasgow Outcome Scale (GOS) of expansile duraplasty vs multiple dural slits in patients with traumatic Ac SDH. The age range in this study was from 15 to 60 years, with a mean age of 35.67 ± 9.78 years. The mean age of patients in group A was 34.91± 9.10 years, and in a group B was 37.11 ± 10.26 years. The majority of the patients, 42 (60.0%), were between 18 to 40 years of age. Out of 70 patients, 47 (67.14%) were males, and 23 (32.86%) were females, with male to female ratio of 2.16:1. However, in my study, favorable outcome (GCS 4, 5) in Group A (wide dural wide flap and duraplasty) was found in 15 (42.86%) patients while in Group B (multiple dural slits) was found in 04 (11.43%) patients (p-value=0.003). According to a study, there were 12 (37.5%) patients in group A (wide dural opening followed by duraplasty) and 3 (9.4%) patients in groupB (multiple dural fenestrations) who had favorable results (GOS: 4, 5) while in group A and group B, 20 (62.5%) and 29 (90.60%) patients had unfavorable result (GOS: 2, 3) 5.

A randomized control study [17] was conducted in the department of neurosurgery, Ayub Medical College, Abbottabad. 59 patients were included in this study, randomly allocated in two groups (i.e., group A and group B) for decompressive craniectomy. Thirty-one patients were operated by craniectomy with full dural flap opening (Group A), and 28 patients were operated by craniectomy with multidural-slits (Group B). Glasgow Outcome score (GOS) at 6 weeks after the surgery was used to determine the outcome. Mean age of the patients was 33.4±12.8 years. Majority of the patients were males. In group A 51.6% of the patients survived out of which a favorable outcome (GOC 3-5) was observed in 41.9% of the patients, and 9.1% of patients ended up in vegetative state. While in group B 46.4% of the patients survived among which favorable outcome was seen in 39.3% of patients and 7.1% of patients ended up in vegetative state. The difference in outcome measure is insignificant.

In a recent systematic literature review Barthélemy et al [18] has evaluated decompressive craniectomy after severe TBI, by comparing the literature with first major RCT on this topic (DECRA). They found that when a comparison was done between Decompressive Craniectomy with multiple dural stabs and DC with open dural flap, dural stab group was found to have a significant advantage in mortality and GOS. They did not analyze the early complications like a CSF leak in different DC techniques.

Tien et al [15] reported that the mortality rate was 100% in patients with a GCS score of 3 and with bilaterally unreactive pupils. Severe TBI with a GCS score of 3 or 4 has been considered an extreme challenge in terms of both neurosurgery and intensive care for both child and adult patients. Therefore, surgical treatment by decompressive craniectomy has often been avoided owing to the poor outcomes and low chance of functional recovery reported [15].

Bhat et al. [19] prospectively assessed 120 patients for a duration of 3 years with severe traumatic acute SDH, with one group using wide DC with dural stabs in 60 cases with another group using conventional dural opening (open dural flap) and removal of acute subdural hematoma in 60 controls. They found an overall survival of 78.3% in the dural-stab group (case-study), with 43.3% of good recovery and with mortality (13/60) of 21.6% as compared to the open dural flap (control) group with 40% survival, good recovery of 11.6% and with the mortality (36/60) of 60%. The open dural flap technique proved dangerous in a traumatic and edematous brain. This dural-stabs technique effectively increased the overall survival of patients with low GCS [19].

In another recent study, Kalim Uddin et al. reported that multiple dural fenestrations are an effective decompressive procedure for removing acute SDH compared to wide dural openings with duraplasty. According to GOS groupA (wide dural opening followed by duraplasty), there was 48% patients with good recovery, moderate disability (16%), severe disability (08%), persistent vegetative state (04%), and 24% died. While in group B (multiple dural fenestrations), good recovery was 47.83%, moderate disability (13.04%), severe disability (4.35%), persistent vegetative state (13.04%), 21.74% died [7].

5. Conclusion

This study concluded that favorable outcome is better after expansile duraplasty in patients with traumatic Ac SDH as compared to multiple dural slits. So, we recommend that expansile duraplasty should be used as a prime technique in patients with traumatic acute subdural hematoma in our general practice to reduce the morbidity and mortality of our population.

References

[1] Umerani MS, Abbas A, Sharif S. Traumatic brain injuries: experience from a tertiary care centre in Pakistan. Turkish neurosurgery. 2014; 24 (1): 19-24.

[2] Khan B, Afridi EA, Khan B, Khan SA, Aurangzeb A, Khan AA, Khan W, Bhatti SN. Decompressive Craniectomy for Acute Subdural Haematoma With Expansile Duraplasty Versus Dural-Slits. Journal of Ayub Medical College Abbottabad. 2016 Jun 1; 28 (2): 285-8.

[3] Prahaladu P, Satyavara Prasad K, Rajasekhar B, Satyanarayana Reddy K. Clinical Study of Acute Subdural Haematoma—A Level I Trauma Care Centre Experience. International Journal of Research in Medical Sciences. 2017; 5: 857- 62.

[4] El Refaee E, Elsayed A, El-Fiki A, El Shitany H. Decompressive Craniotomy and Fast-Track Duraplasty in Acute Subdural Hematomas. Open Journal of Modern Neurosurgery. 2018 Dec 7; 9 (1): 35-42.

[5] Khan AA. Comparison of Decompressive Craniectomy and Multi-Dural Stabs with Decompressive Craniectomy and Open-Dural Flap Method, in the Treatment of Acute Subdural Hematomas. J Rawalpindi Med Coll. 2017; 21 (4): 339-43.

[6] Abbas G, Khan RU, Zubair UB, Bhatti SN. Comparison of Outcome of Decompressive Craniectomy with Wide Dural Flap Duraplasty Versus Dural Slits in the Management of Post Traumatic Acute Subdural Hematoma in Terms of Post-operative CSF Leak. Pakistan Journal Of Neurological Surgery. 2019 Sep 26; 23 (3): 163-9.

[7] Uddin K, Hossain SS, Salam MA, Haque MA, Rahman MM, Kabir AG, Talukder MM. Comparison of Decompressive Craniotomy by Wide Opening of Dura with Multidural Fenestrations Technique among Acute Subdural Hematoma Patients: A Randomized Control Trial. Journal of National Institute of Neurosciences Bangladesh. 2018 Dec 10; 4 (2): 75-81.

[8] Ransohoff J, Benjamin MV, Gage EL Jr, Epstein F. Hemicraniectomy in the management of acute subdural hematoma. J Neurosurg. 1971; 34 (1): 70-6.

[9] Kjellberg RN, Prieto A Jr. Bifrontal decompressive craniotomy for massive cerebral edema. J Neuro-surg. 1971; 34 (4): 488-93.

[10] Venes JL, Collins WF. Bifrontal decompressive craniectomy in the management of head trauma. J Neursurg. 1975; 42 (4): 429-33.

[11] Aarabi B, Hesdorffer DC, Ahn ES, Aresco C, Scalea TM, Eisenberg HM. Outcome following decompressive craniectomy for malignant swelling due to severe head injury. J Neursurg. 2006; 104 (4): 469-79.

[12] Qiu W, Guo C, Shen H, Chen K, Wen L, Huang H, et al. Effects of unilateral decompressive craniectomy on patients with unilateral acute post-traumatic brain swelling after severe traumatic brain injury. Crit Care. 2009; 13 (6): R185.

[13] Chibbaro S, Di Rocco F, Mirone G, Fricia M, Makiese O, Di Emidio P, et al. Decompressive craniectomy and early cranioplasty for the management of severe head injury: a prospective multi-center study on 147 patients. World Neurosurg. 2010; 75 (3-4): 558-62.

[14] Ban SP, Son YJ, Yang HJ, Chung YS, Lee SH, Han DH. Analysis of Complications Following Decompressive Craniectomy for Traumatic Brain Injury. J Korean Neurosurg Soc. 2010; 48 (3): 244-50.

[15] Tien HC, Cunha JR, Wu SN, Chughtai T, Tremblay LN, Brenneman FD, et al. Do trauma patients with a Glasgow Coma Scale score of 3 and bilateral fixed and dilated pupils have any chance of survival? J Trauma. 2006; 60 (2): 274-8.

[16] Cooper DJ, Rosenfeld JV, Murray L, Arabi YM, Davies AR, D'Urso P, et al. Decompressive craniectomy in diffuse traumatic brain injury. N Engl J Med. 2011; 364 (16): 1493-502.

[17] Khan B, Afridi EAK, Khan B, Khan SA, Aurangzeb A, Khan AA, et al. Decompressive craniectomy for acute subdural haematoma with expansile duraplasty versus dural-slits. J Ayub Med Coll Abbottabad 2016; 28 (2): 285–8.

[18] Barthelemy EJ, Melis M, Gordon E, Ullman JS, Germano IM. Decompressive Craniectomy for Severe Traumatic Brain Injury: A Systematic Review. World Neurosurg. 2016; 88: 411-20.

[19] Bhat AR, Kirmani AR, Wani MA. Decompressive craniectomy with multi-dural stabs–a combined (SKIMS) technique to evacuate acute subdural hematoma with underlying severe traumatic brain edema. Asian journal of neurosurgery, 2013; 8 (1): 15.