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Surgical Management of Acute Subdural Hematoma (ASDH): Comparative Study between Duroplasty by Graft and Durotomy in A Tertiary Center

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Abstract

Background: Traumatic acute subdural hematoma is amongst the most dangerous and devastating type of head injuries. Clinically most patients present with Glasgow coma scale of 8 or lower. Clinically most patients present with Glasgow coma scale of 8 or lower.

Aim of Study: The study is to evaluate the best surgical approach to deal with acute SDH and what are the prognostic factors affecting the best outcome.

Patients and Methods: This is a retrospective study examining 80 patients with acute subdural hematoma presenting into our Department of Neurosurgery in Beni Suef University and Kasr El-Aini from 2016 to 2022.

40 of which were operated upon by decompressive craniectomy and duroplasty and bone flap removal and placing the bone flap in the patient's abdominal wall and the other 40 were operated upon by decompressive craniotomy and dural snips. And not water tight fixation of the bone.

Glasgow coma scale was used to assess conscious level before and after surgery and CT brain was the imaging method used in the initial diagnosis and the follow-up after surgery.

Results:

Results were divided into two groups:

The first is the group in which decompressive craniotomy was paired with dural snips and the second in which it was paired with dural graft and removal of the bone flap and placing it in the patient's abdominal wall.

Conclusion: We found in our study that pairing dural snips with craniotomy was better than dural graft and bone flap removal because of significant decrease in procedure time and blood loss and there was less post-operative rebound oedema with no apparent difference in the extent of removal of the hematoma the only drawback we had was in 5 patients in which there was active bleeding and the dural snips didn't give access to stop the bleeder in these cases we had to widen the dural excision and the dura was later closed with a graft but there was no need to remove the bone graft in conclusion in cases with no active bleeding we prefer the dural snips rather than the more extensive dural graft and bone flap removal.

Key Words: *ASDH – CT brain – Evacuation – Hematoma – Decompressive & GCS – CT brain – Dura – Craniectomy and craniotomy.*

Introduction

TRAUMATIC acute subdural hematoma is amongst the most dangerous and devastating type of head injuries associated with severe generalized brain injury or cerebral contusions and other forms of hemorrhage An ASDH is defined as a SDH that is diagnosed within 14 days of traumatic brain injury [1]. Clinically most patients present with Glasgow coma scale of 8 or lower [2]. ASDH are seen in 10-20% of all traumatic brain injuries and are diagnosed by a non-contrast CT brain [3], and if its size is larger than 1cm at its thickest point will need urgent surgical intervention which is usually a decompressive surgery through a large bone flap to remove the hematoma and control the bleeding source smaller SDH will need ICP monitoring and follow-up CT and may need surgery later on other associated hemorrhages are dealt with through the same large bone flap [4].

Patients and Methods

This is a retrospective study examining 80 patients with acute subdural hematoma presenting

Abbreviations:

ASDH : Acute subdural hematoma.
MOT : Mode of trauma.
AD : Admission.
GCS : Glasgow coma scale.
POST : Postoperative motor power.
MP : Motor power.
MCA : Motor car accident.
FFH : Fall from.

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into our Department of Neurosurgery in Beni Seuf University and Kasr El Aini from 2016 to 2022.

40 of which were operated upon by decompressive craniectomy and duroplasty and bone flap removal and placing the bone flap in the patient's abdominal wall and the other 40 were operated upon by decompressive craniotomy and dural snips. And not water tight fixation of the bone.

Glasgow coma scale was used to assess conscious level before and after surgery and CT brain was the imaging method used in the initial diagnosis and the follow-up after surgery.

Results

In Surgically managed acute subdural hematomas by dural snips and decompressive craniotomy:

The mean age 31.6 (79%), 28 (70%) cases were males and 12 (30%) cases were females. The mode of trauma was motor vehicle accident in 30 (75%) cases, 8 (20%) cases fall from height & 2 (5%) cases were spontaneous. The Glasgow coma scale (GCS) on admission from 13-15 were 8 (20%), from 9-12 were 20 (50%) cases & from 3-8 were 12 (30%) cases.

Mean age 29.4 (73.5%), 30 (75%) cases were males and 10 (25%) cases were females. The mode of trauma motor vehicle accident in 27 (67.5%) cases, 11 (27.5%) of cases fall from height & 2 (5%) cases were spontaneous. The Glasgow coma scale (GCS) on admission from 13-15 were 5 (12.5%), from 9-12 were 23 (57.5%) cases & from 3-8 were 12 (30%) cases.

The first is the group in which decompressive craniotomy was paired with dural snips and the second in which it was paired with dural graft and removal of the bone flap and placing it in the patient's abdominal wall.

Surgically managed acute subdural hematoma cases by dural graft and decompressive craniectomy (putting the bone flap in the abdominal wall):

The mean age 31.6 (79%), 28 (70%) cases were males and 12 (30%) cases were females. The mode of trauma was motor vehicle accident in 30 (75%) cases, 8 (20%) cases fall from height & 2 (5%) cases were spontaneous. The Glasgow coma scale (GCS) on admission from 13-15 were 8 (20%), from 9-12 were 20 (50%) cases & from 3-8 were 12 (30%) cases. The motor power on ER examination were grade 5 in 10 (25%) cases, grade 4 in 4 (10%) case & grade from 1-3 26 (65%) cases. Other intracranial pathology was intracerebral hematoma in 2 (5%) cases & extradural hematomata in 1 (2.5%) case which managed conservative. The operation done in all 40 (100%) cases by dural snips (multiple longitudinal and transverse incisions around 3cm in length for each & decompressive craniotomy in which the bone is inserted flail). Postoperative GCS, from 13-15 in 18 (45%) cases, 9-12 in 8 (20%) cases from 3-8 in 12 (30%) cases. Postoperative motor power was grade 5 in 11 (27.5%) cases, grade 4 in 12 (30%) cases & grade from 1-3 in 17 (42.5%) cases. CT brain done ASDH in all 40 cases, EDH was present in 1 case (2.5%) & ICH in 2 (5%) of cases, recurrence was in 2 (5%) cases which is re evacuated. The prognosis was good in 29 (72.5%) of case bad in 11 (27.5% cases. CT brain was good in 24 (60%) cases, infarction in 11 (27.5%) case & brain edema in 1 (2.5%) case. Mortality was 13 cases. Postoperative wound complications were CSF leak in in 2 (5%) cases & wound infection in 3 (7.5%) cases.

Mean age 29.4 (73.5%), 30 (75%) cases were males and 10 (25%) cases were females. The mode of trauma motor vehicle accident in 27 (67.5%) cases, 11 (27.5%) of cases fall from height & 2 (5%) cases were spontaneous. The Glasgow coma scale (GCS) on admission from 13-15 were 5 (12.5%), from 9-12 were 23 (57.5%) cases & from 3-8 were 12 (30%) cases. The motor power on ER examination were grade 5 in 12 (30%) cases, grade 4 in (15%) case & grade from 1-3 22 (55%) cases. Other intracranial pathology was extradural hematomata in 2 (5%) cases which managed surgically. The operation done in all 40 (100%) cases by dural graft by pericranium decompressive craniectomy & evacuation of the hematoma by saline irrigation and gentle suction of the subdural hematoma. Postoperative GCS, from 13-15 in 12 (30%) cases, 9-12 in 12 (30%) cases, from 3-8 in 16 (40%) cases. Postoperative motor power was grade 5 in 20 (50 %) cases, grade 4 in 3 (7.5%) cases & grade from 1-3 in 17 (42.5%) of cases. CT brain done ASDH in all 40 cases, EDH in 2 (5%) case. The prognosis was good in 20 (50%) case bad in 20 (50%) cases. CT brain was good in 22 (55%) cases, infarction in 18 (45%) case & brain edema 12 in (30 %) case. Mortality was 21 cases (Postoperative wound complications were CSF leak in in 1 (2.5%) cases & wound infection in 5 (12.5%) cases.

Table (1): Dural snips series.

	Age	Sex	MOT	Ad GCS	Motor power	Another path	Operation	Post GCS	Post MP	CT	Prog.	CT f-up	Post COMP
1	25	M	MCA	12	5		In all	14	5	ASDH	GOOD	GOOD	–
2	40	M	MCA	13	5		Decomp.	14	5	ASDH	GOOD	GOOD	–
3	30	M	MCA	133	4		Dural snip	15	4	ASDH	GOOD	GOOD	–
4	50	M	MCA	7	5		Bone	13	5	ASDH	GOOD	GOOD	–
5	13	F	MCA	8	3		Flail	12	4	ASDH	GOOD	GOOD	–
6	7	F	MCA	9	3	–		3	4	ASDH	BAD	Infar	–
7	18	M	FFH	10	3	–		13	4	ASDH	GOOD	GOOD	–
8	60	M	MCA	11	4	–		13	4	ASDH	GOOD	GOOD	–
9	23	M	MCA	12	5	–		14	5	ASDH	GOOD	GOOD	CSF leak
10	40	M	MCA	13	5	–		13	5	ASDH	GOOD	GOOD	–
11	41	M	FFH	8	2	–		3	3	ASDH	BAD	Infar	–
12	47	F	MCA	8	1	ICH		3	3	ASDH+ ICH	BAD	Infar	–
13	30	F	MCA	9	2	ICH		13	4	ASDH+ ICH	GOOD	GOOD	Wound infection
14	20	F	MCA	10	3	EDH		12	3	ASDH+ EDH	GOOD	GOOD	–
15	10	M	FFH	12	3	–		12	3	ASDH	GOOD	GOOD	–
16	12	M	FFH	14	5	–		14	5	ASDH	GOOD	GOOD	–
17	29	F	MCA	7	3	–		3	3	ASDH	BAD	Infar	–
18	33	F	MCA	8	2	–		3	3	ASDH	BAD	Infar	–
19	40	M	MCA	10	3	–		15	3	ASDH	GOOD		–
20	47	M	MCA	12	4	–		15	3	ASDH	GOOD	GOOD	–
21	30	M	MCA	12	3	–		14	4	ASDH	GOOD	GOOD	–
22	30	M	MCA	13	3	–		14	4	ASDH	GOOD	GOOD	–
23	40	M	MCA	13	4	–		14	4	ASDH	GOOD	GOOD	–
24	43	M	MCA	13	5	–		15	5	ASDH	GOOD	GOOD	–
25	53	M	MCA	12	5	–		14	5	ASDH	GOOD	GOOD	–
26	60	M	MCA	11	5			13	5	ASDH	GOOD	GOOD	–
27	70	M	Spo	9	3	EDH		12	3	ASDH	GOOD	GOOD	–
28	52	M	MCA	8	3			3	4	ASDH	BAD	Infar	–
29	31	F	MCA	7	2			3	3	ASDH	BAD	Infar	–
30	15	M	MCA	6	1	ICH		3	3	ASDH+ ICH	BAD	Infar	–
31	9	M	FFH	8	3	–		13	4	ASDH	GOOD	GOOD	CSF LEAK
32	10	F	FFH	9	3	–		13	5	ASDH	GOOD	GOOD	
33	13	F	MCA	10	3	ICH		12	3	ASDH+ ICH	GOOD	GOOD	
34	7	F	FFH	13	5	–		14	5	ASDH	GOOD	GOOD	–
35	6	M	FFH	12	2	–		12	3	ASDH	GOOD	GOOD	Wound infection
36	5	M	MCA	9	2	–		10	2	ASDH	GOOD	GOOD	–
37	24	F	MCA	8	3	–		9	3	ASDH	BAD	Infar	–
38	42	M	MCA	7	2	–		10	2	ASDH	GOOD	GOOD	Wound infection
39	50	M	MCA	9	3	–		3	3	ASDH	BAD	Infar	
40	60	M	MCA	10	5	–		3	4	ASDH	BAD	Infar	

Table (2): Dural graft (duroplasty) series.

	Age	Sex	MOT	Ad GCS	Ad MP	Another path	Operation	Post GCS	Post MP	CT	Prog.	CT Post	Comp
1	30	M	MCA	13	5		In all	15	5	SD	G	N	–
2	40	M	MCA	14	5		Dural graft	15	5		G	N	–
3	22	M	MCA	12	5		Bone	13	5		G	N	–
4	12	M	MCA	11	5		Removal	13	5		G	N	–
5	13	M	MCA	10	5	–		13	5		G	N	CSF leak
6	17	F	MCA	8	3	–		4	5		B	N	
7	19	F	FFH	13	4	–		15	5		G	N	
8	16	F	MCA	12	2	–		8	4		B	Infar	–
9	49	M	MCA	11	1	–		7	5	IV	B	Infar	–
10	30	M	MCA	9	5	–		12	3		B	Infar	–
11	52	F	MCA	8	1	–		6	5		B	Infar	–
12	62	M	MCA	7	3	–		3	3		B	Infar	–
13	12	M	FFH	6	3	–		3	3		B	Infar	–
14	7	M	FFH	7	2	–		3	3		B	Infar o	W inf.
15	9	M	MCA	8	5	–		12	3		G	N	
16	12	M	MCA	12	5	–		14	3		G	N	
17	21	M	FFH	14	3	–		15	5		G	N	–
18	42	M	MCA	8	5	–		6	3		B	Inf	W inf.
19	44	M	MCA	11	5	–		8	5		B	Inf o	
20	23	M	MCA	11	3	–		11	5		B	Inf o	
21	12	M	FFH	7	3	–		7	3		B	Inf o	–
22	30	F	MCA	9	3	–		9	3		B	Inf o	–
23	35	M	MCA	10	3	–		10	3		G	N	–
24	46	F	MCA	11	4	–		11	4		G	N	–
25	40	M	MCA	9	3	–		9	5		G	N	–
26	19	M	FFH	12	4	–		13	5		G	N	–
27	12	M	FFH	13	5	–		13	5		G	N	–
28	7	F	FFH	13	5	–		13	5		G	N	–
29	61	M	MCA	12	5			12	5		G	N	–
30	70	F	MCA	11	4			11	5		G	N	–
31	30	M	MCA	10	3			13	4		G	N	–
32	51	M	MCA	9	4			9	4	ED	B	Inf o	–
33	18	M	MCA	8	5	EDH EVC.		8	5	ED	B	Inf o	–
34	37	M	MCA	7	3	EDH EVC.		3	5		B	Inf o	W inf.
35	56	M	MCA	6	3	–		3	3		B	Inf o	–
36	19	M	MCA	12	3	–		3	3		B	Inf o	W in.f.
37	40	M	MCA	12	4	–		4	2		B	Inf o	
38	51	M	MCA	11	5	–		11	2		G	N	
39	7	F	FFH	10	3	–		10	3		G	N	–
40	9	F	FFH	9	3	–		9	5		B	Inf o	–

Cases 1:

Male patient 25 years old with motor car accident with GCS 12, motor power grade 5 in the right side,operated upon by decompressive craniotomy & dural snips (durotomy), evacuation of the hematoma. Post operative GCS was 14. Patients discharged without deficits.

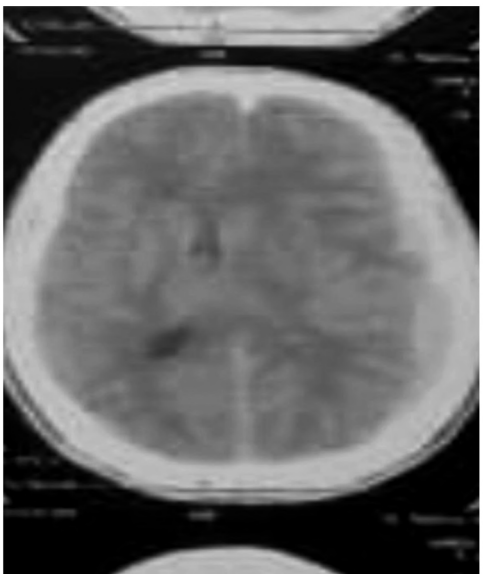

Fig. (1): Pre-operative CT.

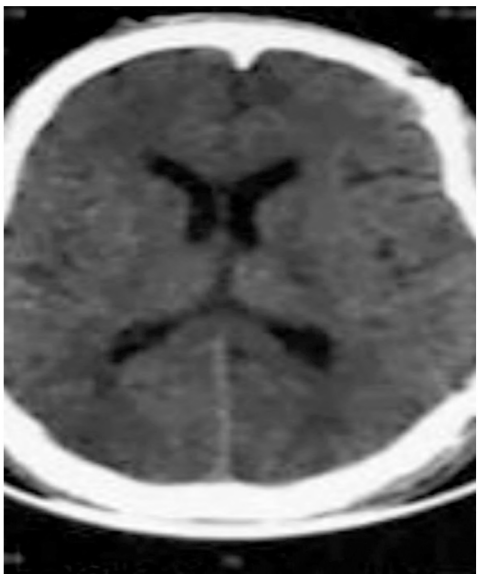

Fig. (1): Post-operative CT.

Fig. (2): Operative image of ASDH (dural snips).

Case (2):

22 years old male patient with motor car accident, with GCS 12 with intact motor power operated upon by decompressive craniectomy, dural graft and evacuation of ASDH. Post operative patient GCS 13/15, CT brain done post operative was good and the patient discharged home GCS 15/15.

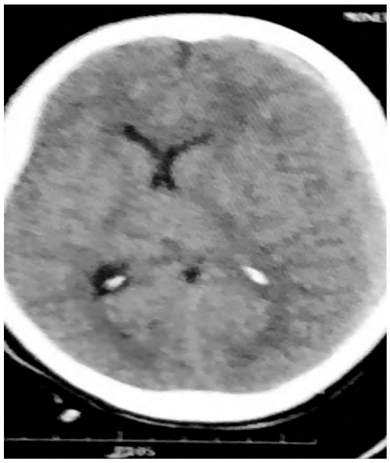

Fig. (3): Pre-operative CT brain.

Fig. (3): Post-operative CT brain.

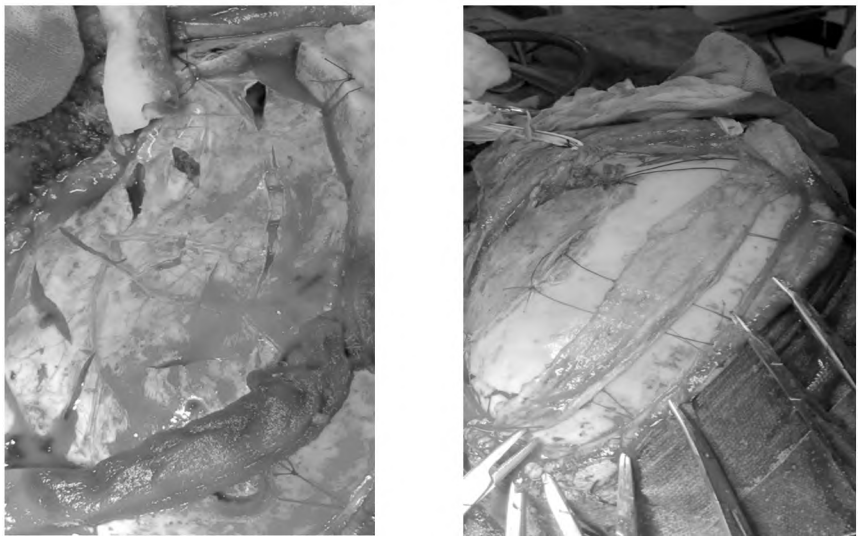

Fig. (4): Operative image of ASDH dural snips.

Discussion

The decision for conservative versus surgical management of ASDH is influenced by the GCS grading; CT results, such as midline shift, ASDH clot thickness and volume, and normal the basal cisterns; and the salvageability of the patient (i.e., whether the primary injury is so severe that evacuation of the ASDH will not make a difference in results). On the basis of the reviewed literature, a clot thickness greater than 10mm or an MLS greater than 5mm are suggested as critical parameters for surgical evacuation of an acute SDH, regardless of the GCS in dead GCS 3 will not improve.

Acute subdural hematoma is a neurosurgical emergency that must be evacuated as soon as the patient came to the emergency room of the hospital after doing CT brain. In fact, the time factor is important for best out come after surgery of ASDH. There is an important process in the surgery of ASDH which is decompressive craniectomy or craniotomy (large bone flap as much as possible) to decompress the brain. In ASDH, the trauma is severe and the conscious level mostly depressed due to the violence of trauma and the associated brain edema or other pathology as diffuse axonal injury. In surgery of ASDH, the most dangerous complication is rebound brain edema during doing

duroplasty, which causing more brain edema and the volume of the brain exceed the level of the bone flap and the GCS of the patient is more deteriorated post operative in spite of giving the patient all measures to decrease the brain edema. In our study we have 2 groups of patients who are operated upon. 40 patients operated upon by decompressive craniotomy and dural snips (multiple longitudinal and transverse opening of the dura), the subdural hematoma which under pressure come out assisted by saline irrigation. In this series the brain is maintained without rebound edema, and another group of 40 patients operated by decompressive craniectomy (bone removal and put it in the abdomen), the GCS from 3 to 12 was in 30 to 80% of patients this with Dent et al., Cordobes et al., **[5]**, in patents with dural snips, and in the group with duroplasty was 12 to 57% which is against Dent et al. and Cordobes et al., **[5]** the mortality rate was in 11 patients 27.5% in group with dural snips and 52.5% in group with duroplasty this with against Gennarelli et al., **[6]**.

Kotwica et al., **[7]** which was 40 to 60%. The motor power improved post operative. The mode of trauma was motor vehicle accident in 75% in dural snips cases & 67.5 in duroplasty series and 20% fall from height in dural snips series and 27.5% in duroplasty series this is against Willberg et.al., **[8]** and Seeling et al., **[1]**, series.

The GCS from 3-8 was in 30% in our study this is against Fell D et al., **[9]** and Paterniti et al., **[10]** which was 37-80%. The mortality rate was 32.5% in dural snips series this is against Haselberger et al., **[11]** which was from 40-60% mortality against dural graft series which was 52.5%. ASDH operated by dural snips associated with other intracranial pathology as contusions EDH, intracerebral hemorrhage in 7.5% and in series operated with duroplasty in 5% of patients, this is against Cordobes F et al., **[2]**.

The volume of ASDH and the midline shift (MLS) and the GCS associated with good outcome this is with Howards et al., **[12]** young age associated with good outcome which is also with Van den Drink et al., **[13]**.

Zumkeller et al., **[14]** investigated CT scan parameters in 174 patients with SDH and a GCS between 3 and 15 undergoing surgeries. The findings revealed a 10% mortality rate in patients with a clot thickness of less than 10mm, and a 90% mortality for patients with clots thicker than 30mm, in our series all cases have thickness more than 1 0mm.

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التدخل الجراحى لعلاج النزيف الحاد تحت الام الجافية بالمخ، دراسة مقارنة بين وضع رقعة بالأم الجافية بالمخ وعمل فتحات بالأم الجافية بدون رقعة

المقدمة : التدخل الجراحى لعلاج النزيف تحت الام الجافية بالمخ، دراسة مقارنة بين وضع رقعة بالام الجافية وتفريغ النزيف وعمل فتحات بالام الجافية بالمخ وتفريغ النزيف. يعتبر النزيف تحت الام الجافية بالمخ من أخطر أنواع النزيف المخ. حيث أنه ينتج عن إصابة شديدة بالرأس وتكون درجة الوعى غالباً متأخرة ما بين ٧ و٨ غلى مقياس جلاسكو لتقييم درجة الوعى وتم عمل هذه الدراسة.

الهدف من الدراسة : مراجعة أحسن الطرق الجراحية لتفريغ النزيف تحت الام الجافية بالمخ للحصول على أفضل النتائج.

طرق الدراسة ومكوناتها : دراسة ٨٠ حالة تعانى من نزيف تحت الام الجافية بالمخ فى مستشفيات جامعة بنى سويف ومستشفيات جامعة القاهرة

وقت الدراسة : فى الفترة ما بين مايو ٢٠١٦ و مارس ٢٠٢٢.

حجم العينات : الدراسة شملت ٤٠ مريض تم عمل فتحات بالام الجافية بالمخ وترك عظمة المخ مكانها و٤٠ مريض تم وضع رقعة بالام الجافية بالمخ ووضع عظمة المخ بالبطن.

معايير الاقصاء : درجة وعى المريض ٣ على مقياس درجة الوعى.

معايير الانضمام :كل الفئات العمرية تم ضمها.

التوصيات : تم دراسة مقارنة بين عمات فتحات بالام الجافية بالمخ وترك عظمة المخ مكانها أثبتت الدراسة أنها أفضل من وضع رقعة بالام الجافية من حيث زمن العملية والارتشاح المخ أثناء العملية والنزيف بالمخ فى عملية تفريغ النزيف تحت الام الجافية بالمخ.