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Original article

Surgical Treatment of Chronic Subdural Hematoma: Clinical Characteristic, Surgical Outcome, Complication and Recurrence Rate

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Abstract

Background: Chronic subdural hematoma is one of the most frequent neurosurgical conditions encountered in elderly people (usually, after minor head trauma) and in patients on long term anticoagulation and long term hemodialysis. The aims of this study is to evaluate the clinical characteristics found in chronic subdural hematoma patients & the surgical outcomes, complications and recurrence rate in chronic subdural hematoma patients. ***Method:*** A prospective study of surgical treatment of chronic subdural hematoma, clinical characteristics, surgical outcomes, complication and recurrence rate was done over a period of 2 months between 1st June, 2020 and 31st July, 2020 at GMC Jammu. ***Result:*** A total of 35 patients of chronic subdural hematoma, 28 males and 7 females underwent surgery. Maximum were in the age group range of 66-70 years and 81-85 years. 20 cases developed SDH after trauma (due to fall) and 15 cases developed spontaneous SDH. The most common presenting complaint of patients seen in our study was hemiplegia/hemiparesis in 26 cases followed by headache in 15 cases. 10 cases were found to have bilateral hematoma. The most common post-operative complication observed was reaccumulation of hematoma seen in 4 cases. In our study out of 35 patients 27 had GCS score of 15. These patients were discharged home earlier post-operatively, with good outcome. Surgical outcome was good in 100% cases & 0% surgical mortality was observed. ***Conclusion:*** Burr hole evacuation for chronic subdural hematoma provides significant improvements is neurological status and good outcomes with 0% mortality observed in our study.

Introduction

Chronic subdural hematoma is one of the most frequent neurosurgical conditions. It is frequently encountered in elderly people (usually, after minor head trauma) and in patients on long term anticoagulation and long term hemodialysis.

It is due to rupture of veins between dura and brain (cerebral hemisphere) and there is gradual collection of blood in subdural space. Usual hematoma collection is 60-120 ml. Subdural hematomas are divided into acute, subacute and chronic types. Acute hematomas are those that are clinically evident within 72 hours of accumulation, chronic hematomas present over 20 days and subacute hematomas are detected between 3 days and 3 weeks.

The annual incidence of chronic subdural hematoma has been estimated at 1.7 per 100,000 population (Fogelholm et al 1975b). Males outnumber females by a ratio of 2 or 3:1 (McKissock et al 1960; Baechli et al 2004). Two age groups are most at risk of developing chronic subdural hematoma: the young and the elderly. Advanced age and chronic alcoholism are common antecedents, presumably because of brain atrophy, which causes stretching of bridging veins and thus predisposes to tearing. Recently implanted CSF shunts, CSF fistulae, coagulopathy, bone marrow transplantation, arachnoid cysts, renal dialysis, vascular malformations and seizures have been reported to predispose to chronic subdural hematoma formation. The risk of intracranial hemorrhage is increased 13 times in women and 4 times in men who are receiving anticoagulation.

15-20% of chronic subdural hematomas are bilateral (McKissock et al). They tended to occur more in patients with anticoagulant or antiplatelet therapy (Tsai et al 2010). Bilateral chronic hematoma is common in patients with symmetrical frontal and occipital cranial vault. In asymmetrical cranium, chronic subdural hematoma is usually present on the same side of the most curved frontal and occipital convexity (Akhaddar et al, 2010).

One day after the initial hemorrhage, the outer surface of the hematoma is covered with a thin layer of fibrin, and fibroblasts begin to migrate towards the clot. This migration increases, and the fibroblasts proliferate so that by the 4th day a membrane 3-4 cells thick is present on the outer surface of the clot. Over the next week, the outer membrane progressively enlarges, and fibroblasts begin to invade the hematoma itself. A thin inner membrane of fibroblasts is present after 2 weeks. The lack of counter-pressure in predisposed patients may permit growth of a small hematoma that might otherwise resolve spontaneously (LEE et al 1998; Maurice Williams 1999).

The second mechanism for subdural hematoma growth is recurrent bleeding from the hematoma capsule (Putnam and Cushing 1925; Ito et al 1987).

Enhanced synthesis of extracellular matrix component following meningeal trauma may also contribute to chronic subdural hematoma formation (Sajanti and Majamaa 2003).

The most frequent presenting symptoms are headache, cognitive decline, gait abnormalities and hemiparesis. Headache occurs in 30-90 % cases. At times the headache is described as mild and generalizes; however, in three-fourth cases, at least one of the following features is present: sudden onset, severe pain, exacerbation with coughing, straining, or exercise, nausea and vomiting. Altered mental status is a frequent complaint. Although this may manifest as mild confusion or dementia, the changes may be more profound and the patient may have a markedly decreased level of consciousness or may even be obtunded. Mental status changes are probably responsible for the labelling of many patients with chronic subdural hematomas as suffering from psychiatric disease. Hemiparesis is also a common presenting complaint, and the neurologic dysfunction is usually contralateral to the hematoma; however at times it may be ipsilateral.

Chronic subdural hematomas occasionally present as transient ischemic attacks. When this occurs, the average duration of neurologic dysfunction is 30 mins and the patient most commonly experiences aphasia, hemiparesis, or a hemi-sensory deficit. Epilepsy is the initial symptom in 3-11% of patients with chronic subdural hematomas. Lower mean Glasgow Coma Scale score was found independently predictive of seizures in patients with subdural hematoma; seizures frequently occurred within the first three months of illness. Chronic subdural hematoma occasionally present with varied extrapyramidal manifestations like choreoathetoid movement and parkinsonism (Lilang et al 2002).

The diagnosis of traumatic intracerebral hematoma is made quickly and accurately with CT or MRI. The chronic hematoma is dynamic; therefore, its appearance on CT is dependent on the phase of development. In the week after the initial hemorrhage, the acute blood is hyperdense to the normal brain, then generally isodense to normal brain for a period of 1-3 weeks after the initial bleed, and finally hypodense after 3 weeks in the chronic phase. Isodense hematomas may be detected indirectly, that is, by evidence of mass effect manifested by sulci displacement, deformation of the ventricular anatomy and obliteration of the cisterns. Sometimes differentiation of subacute hemorrhage and chronic hemorrhage is difficult with CT, then MRI is the informative and precise study (William and Hogg 2000).

Advocates for medical management of chronic hematoma have not been convincing (Bender and Christoff 1974), failures are common (Gjerris and Schmidt 1974), and most comparisons strongly favor surgical drainage. Not only is the outcome better, but hospital stay and expenses are also less.

Chronic hematomas have been evacuated by craniotomies, burr holes and twist drill craniotomies. Burr hole location is guided by hematoma size and shape. The patient is positioned on the table with the affected side up (for bilateral hematomas both sides of the head are draped and the larger one is drained first). Two holes suffice in most cases; frontal and parietal placement at the anterior and posterior margins of the collection usually works well. The dura over the anterior burr hole is opened first to prevent premature collapse of the subdural space. On opening the dura, a thick outer hematoma membrane is encountered. The composition of hematoma varies with the age of the blood, from fresh clot to thin xanthochromic fluid. In most cases the hematoma has an intermediate appearance and has been described as resembling crankcase oil. If intracranial pressure is high, considerable fluid leakage occurs and the brain often re-expands. Irrigation is recommended for residual fluid; catheters with multiple fenestrations are gently threaded into subdural spaces and irrigated by gravity until the return fluid is clear. Evacuation and closed drainage through a twist drill hole is simple, safe and effective (Tabaddor and Shulman 1977).

The most common post-operative complications encountered are:

- Reaccumulation of hematoma
- Subdural empyema
- Putaminal hemorrhage
- Cerebral Infarction
- Pneumocephalus
- Epilepsy
- Meningitis
- Coning

Medical complications such as pneumonia, ileus, DIC are common postoperatively especially in the elderly and debilitated (Rhode et al 2002).

The most common and vexing postoperative problem is that of accumulation of subdural hematoma; the risk is about 15% (Tindall et al 1976; Baechli et al 2004). Recurrence has been reported to be more common when the collections appear isointense or hypointense to brain on preoperative T1-MRI images (Tsutsumi et al 1997). It is also more likely in wider hematomas and less likely when there are multiple cavities (Yamamoto et al 2003; Stanisic et al 2005). Univariate and multivariate analysis found that bilateral chronic hematoma was an independent risk factor for the recurrence of hematoma. Another multivariate regression analysis identified the number of holes as an important predictor for postoperative recurrence (Taussky et al 2008).

Factors which lead to recurrence are:

- Skin subdural hematoma
- Anticoagulant therapy
- Brain re-expansion
- Pneumocephalus
- Intracranial hypotension
- Surgical techniques

The outcome of patients with chronic subdural hematoma is variable. Reported mortality ranges between 0% - 40% with older series reporting about 10% (McKissock et al 1960; Markwalder 1981). Outcome is closely related to patient's neurological function at the time of operation, medical status and age (Missori et al 2000; Gelabert-Gonzalez et al 2005), patients older than 50 years of age have a 5-fold higher mortality. In one study, it was noted that the factors that determined mortality include age, Glasgow Coma Scale score at presentation and associated illnesses like cardiac and renal failure (Ramchandran and Hegde 2007). In the Cox proportional hazards model, only age and discharge to home were related to survival, whereas the type of intervention, whether surgery was performed, size of hematoma, amount of shift, bilateral subdural hematomas and anticoagulant agent use did not affect the long or short term mortality rate (Miranda et al 2011).

The overall causes of mortality are:

- Age
- CVS disease in elderly
- Coagulopathy

- Cerebral Infarction
- Putaminal hemorrhage
- Acute epidural hemorrhage
- Subdural empyema

Aim

The aims and objectives of the present study is to evaluate the:

- Clinical characteristics found in chronic subdural hematoma patients.
- The surgical outcomes, complications and recurrence rate in chronic subdural hematoma patients.

Materials and Methods

A prospective study of surgical treatment of chronic subdural hematoma, clinical characteristics, surgical outcomes, complication and recurrence rate was done over a period of 2 months between 1st June, 2020 and 31st July, 2020 at GMC Jammu.

After initial resuscitation; detailed history and physical examination were taken followed by laboratory investigations.

Laboratory Investigations:

- Complete blood counts
- Prothrombin time and activated partial thromboplastin time
- Blood urea, serum creatinine, Na+, K+, blood sugar
- Blood typing

Imaging Studies:

- CT Scan
  - Plain
  - Contrast
- MRI

Treatment:

- Pre-operative resuscitation
- Nil per mouth
- Intravenous line
- Antibiotics
- Anticonvulsants
- Antacids
- Analgesics
- Catheterisation

CT indications for surgery:

- Chronic SDH with mass effect
- Midline Shift

Surgical Management:

All cases were operated in Neurosurgery OT

- Locally part preparation done
- Administration of local analgesic and some sedation.
- Oxygen via face mask
- Intravenous line to be secured
- Burr hole evacuation done (Parietal only or Parietal and Frontal)
- Dura opened in + fashion
- Flaps coagulated
- Cavity washed with normal saline till clear saline flows out by pushing saline from frontal burr hole
- If only parietal burr hole is made; cavity is washed after placing a F-8 feeding tube
- Layers of skull stitched back

Post-operative Care:

- Antibiotics
- Antiepileptics
- Analgesics
- Bed rest for 72 hours
- Ambulate the patient after 72 hours
- Sutures removed on 8th post-operative day and discharged
- Repeat CT Scan post-operatively if there is a deterioration in neurological status

Results

Table 1: Mean age, sex ratio

Age (Range)	45-90 years
Mean Age	71 years
Males	28
Females	07
Ratio (males:females)	4:1

A total of 35 cases were studied out of which 28 were males and 7 were females making a male:female ratio of 4:1.

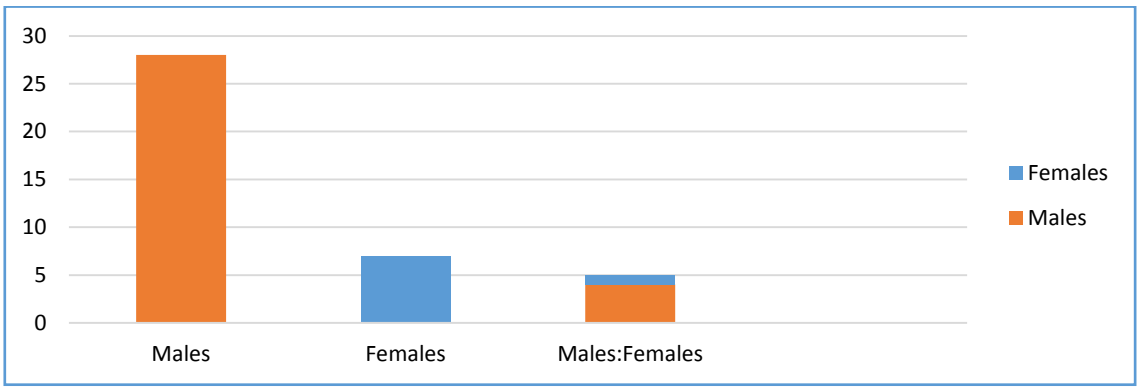

Fig. 1

Table 2: Age incidence in relation to mortality

Age (Years)	No. of Cases	Mortality (%)
>45	00	00
46-50	01	00
51-55	02	00
56-60	04	00
61-65	03	00
66-70	08	00
71-75	04	00
76-80	05	00
81-85	08	00
>86	00	00
Total	**35**	**00**

Mean age of patients admitted was 70.42 years. The most number of patients were in the 66-70 years and 81-85 years old groups.

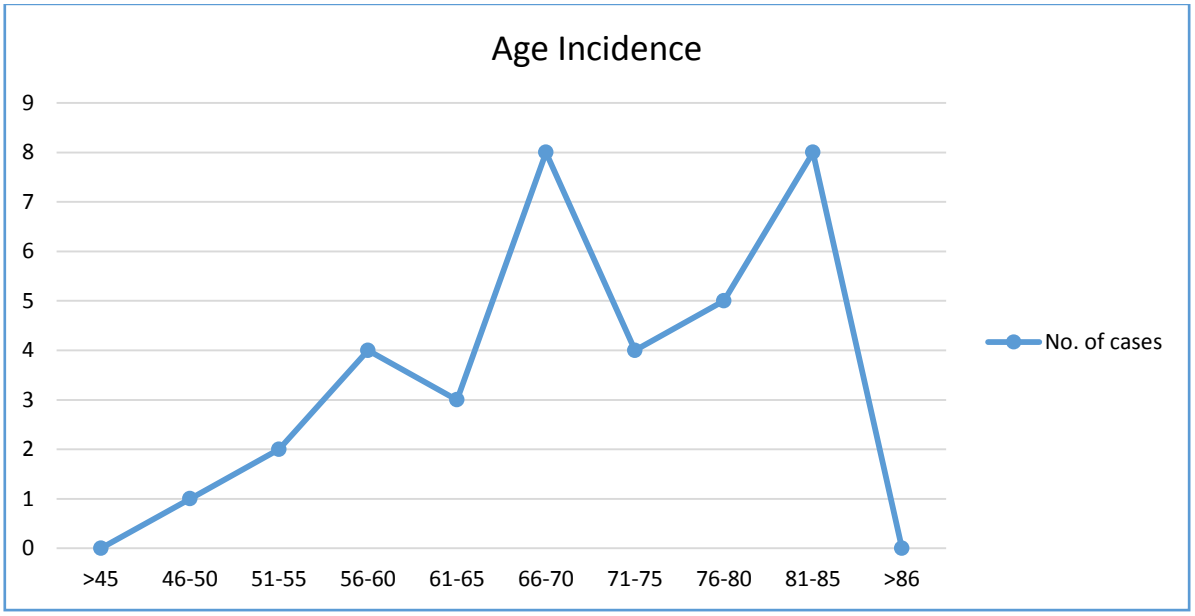

Fig. 2

Table 3: Incidence of traumatic and spontaneous Chronic SDH

	Trauma	Spontaneous
No. of cases	20	15
%	57.14	42.86

Accidental falls account for 57.14% of the cases in the development of SDH. Rest of the cases developed spontaneous chronic subdural hematoma.

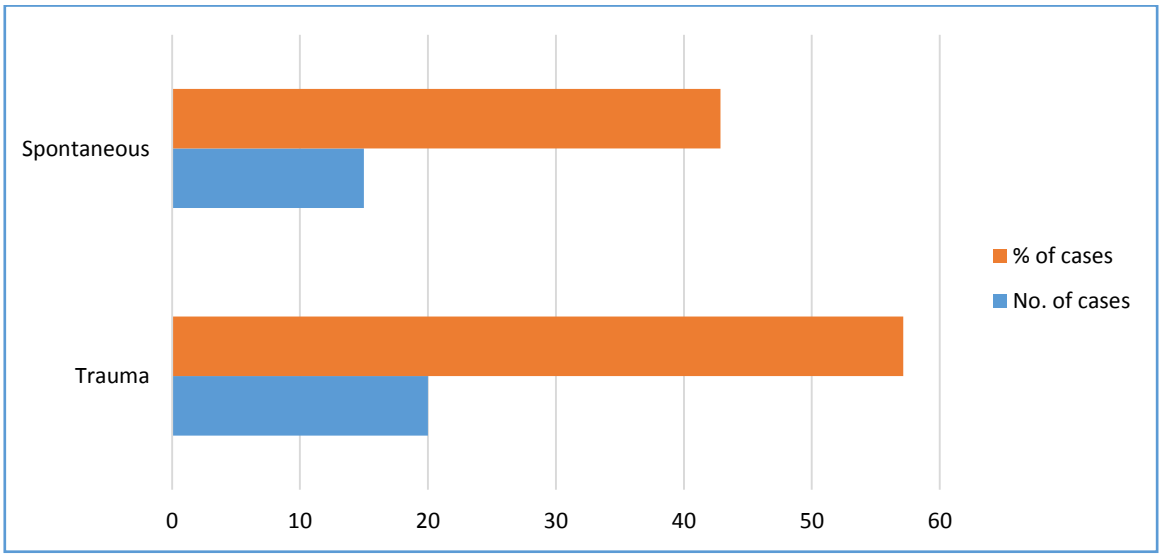

Fig. 3

Table 4: Various presentations in patients with SDH

Clinical Features	No. of cases	% of cases
Headache	15	42.8
Weakness in part/parts of body	26	74.2
Difficulty in speech	14	40
Seizure	03	8.5
Difficulty in walking	18	51.4
Memory Deficit	02	5.7

In majority of the patients, there was a history of weakness of one half of the body or whole body. It was observed in 26(74.2%) cases. Headache was complained of in 15(42.8%) cases, mostly frontal. 18(51.4%) patients experienced difficulty in walking. 14(40%) cases had difficulty in speech. 3(8.5%) cases experienced seizures whereas memory deficit was complained of in 2(5.7%) cases.

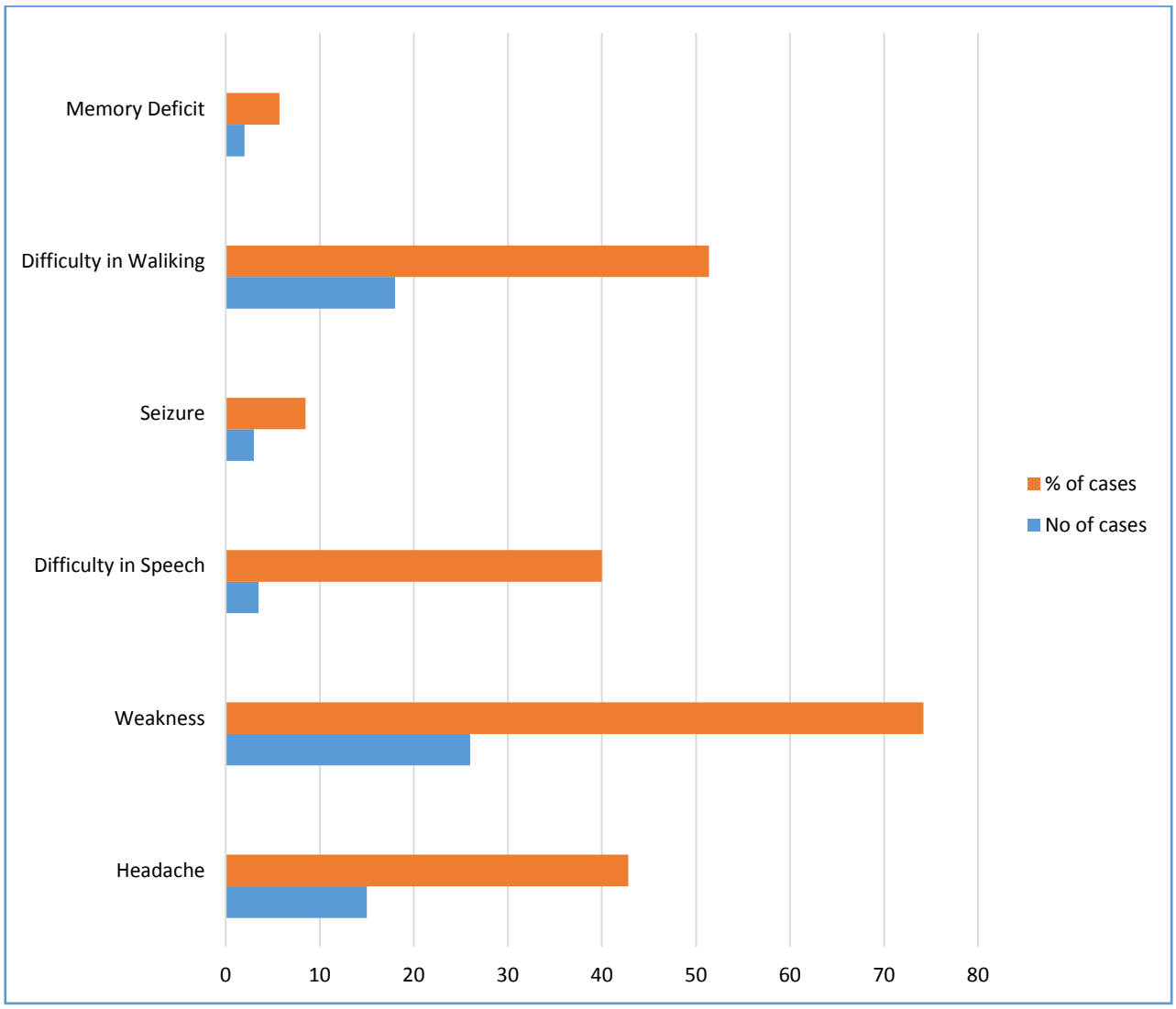

Fig. 4

Table 5: GCS score with respect to outcome and mortality

GCS score	No. of cases	% of cases	Outcome		No of deaths	% of deaths
			Good	Poor		
<5	01	2.8	1	0	0	0
5-7	00	00	0	0	0	0
8-10	04	11.5	4	0	0	0
11-13	03	8.5	3	0	0	0
>13	27	77.2	27	0	0	0

27 cases were reported with a GCS score of >13. Four patients had score of 10. Three patients had a score of 13. One patient had GCS score of 4. All cases were operated with good outcome with no mortality.

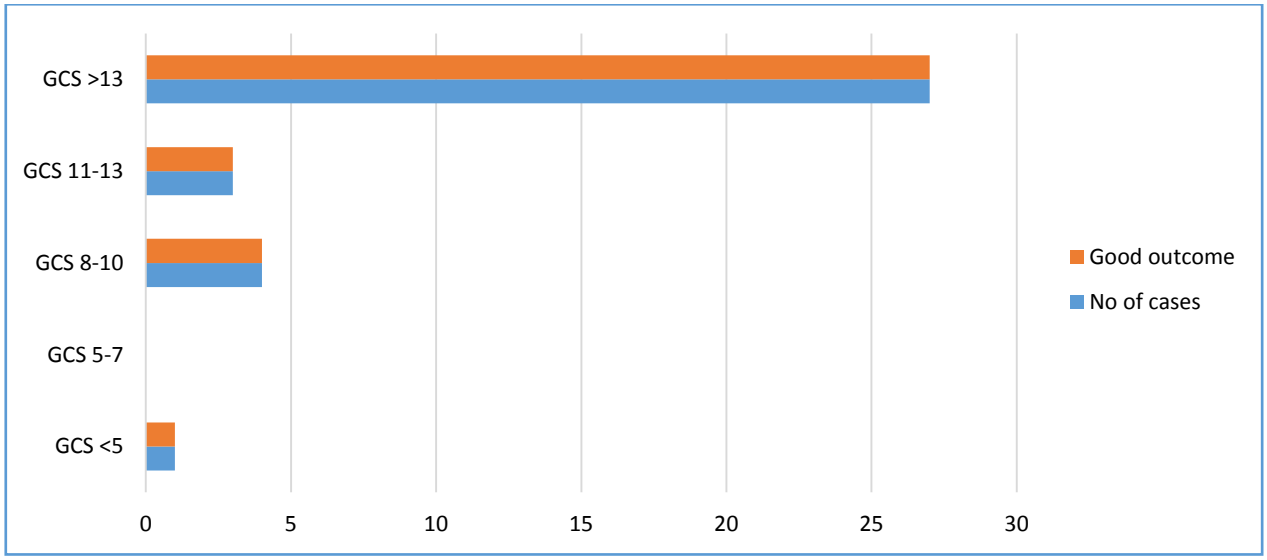

Fig. 5

Table 6: Outcome and mortality in relation to age

Age (years)	No. of cases	% of cases	Outcome		No. of deaths	% of deaths
			Good	Poor		
<70	18	51.4	18	0	0	0
>70	17	48.6	17	0	0	0

18 (51.4%) patients were <70 years of age while 17 (48.6%) patients were >70 years of age. All the cases had good outcome postoperatively with no mortality.

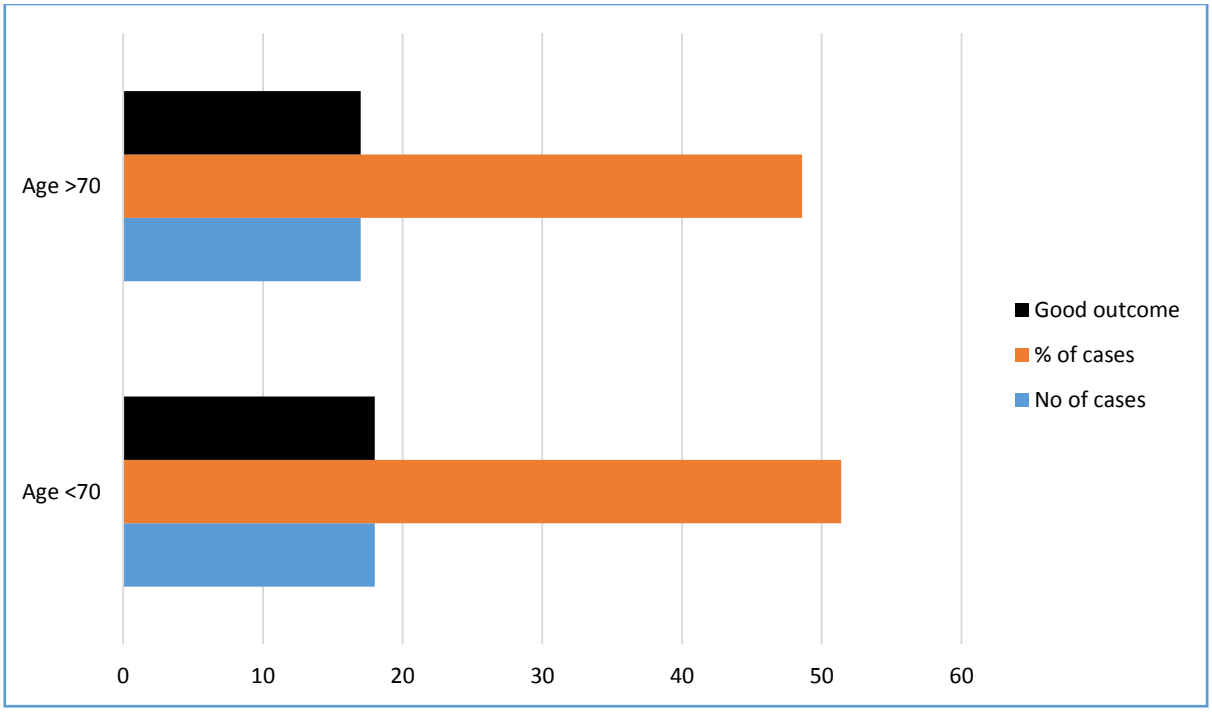

Fig. 6

Table 7: Incidence of unilateral and bilateral SDH

	Unilateral lesion		Bilateral lesion
	Left sided	Right sided	
No of cases	18	07	10
% of cases	20	20	28.6
Outcome	Good	Good	Good

All the cases were scanned by CT to confirm the diagnosis. In 18 cases the lesion was on the left side and in 7 cases the lesion was on the right side. Only 10 (28.6%) cases had bilateral lesions. In all the 35 cases outcome was good.

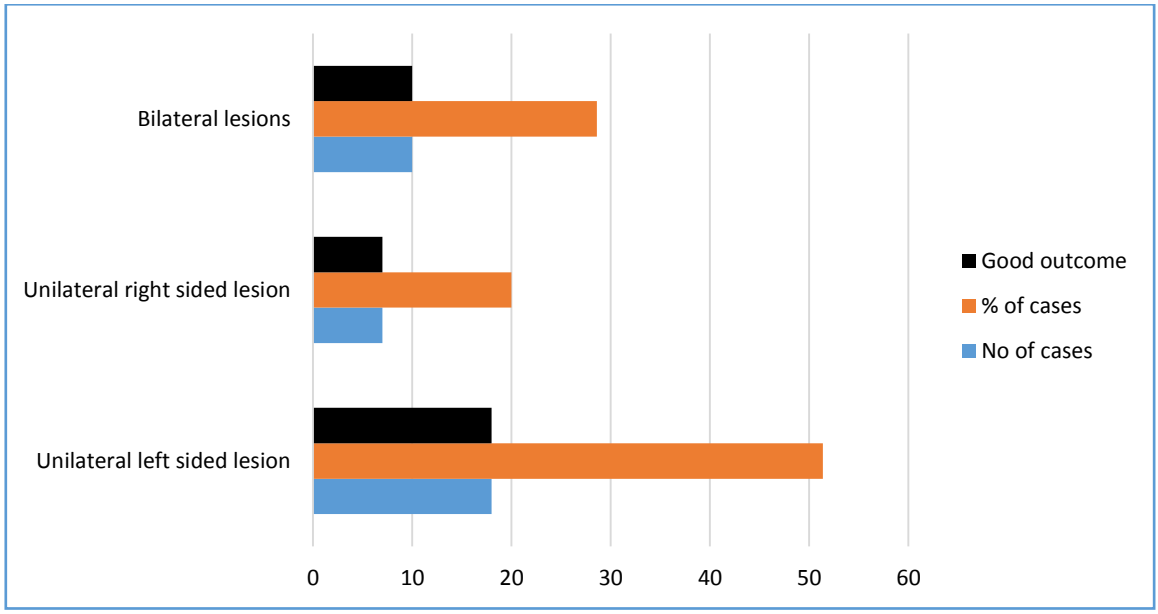

Fig. 7

Table 8: Incidence of various lesions on CT scan

Site of lesion	No. of cases	% of cases
Frontal	01	2.9
Fronto-Parietal	26	74.3
Fronto-Temporal	02	5.7
Fronto-Parieto-Temporal	04	11.4
Fronto-Parieto-Occipital	02	5.7

In our study, 1 hematoma was located in frontal region, 26 hematomas in fronto-parietal region, 2 hematomas in fronto-temporal, 4 hematomas in fronto-parieto-temporal and 2 hematomas were located in fronto-parieto-occipital region.

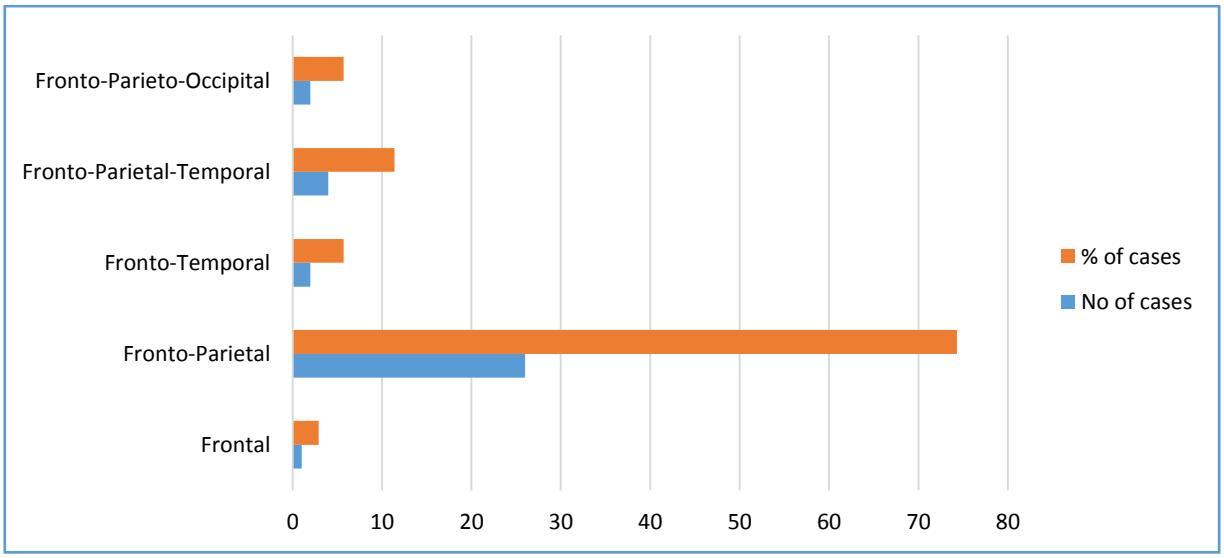

Fig. 8

Table 9: CT scan findings affecting the outcome and mortality

Characteristics	No. of cases	% of cases	Outcome		No of deaths	% of deaths
			Good	Poor		
Max Thickness						
>10 mm	18	51.4	18	0	0	0
10-30 mm	12	34.3	12	0	0	0
>30 mm	05	14.3	05	0	0	0
Midline Shift						
Present	20	57.1	20	0	0	0
Absent	15	42.9	15	0	0	0

18 (51.4%) cases were observed to have <10 mm thickness which raised to 30 cases with <30 mm thickness having good outcome in all 30. Good outcome was seen in all 5 patients with >30 mm thickness. Midline shift was seen in 20 (57.1%) cases. The overall outcome was good in all cases irrespective of presence or absence of midline shift.

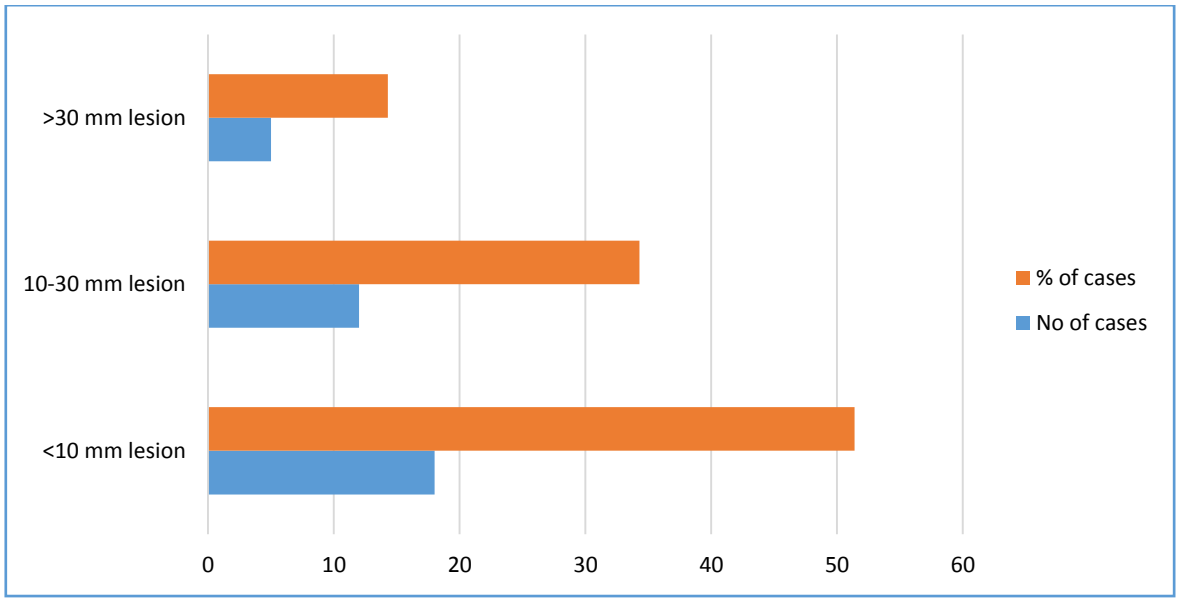

Fig. 9

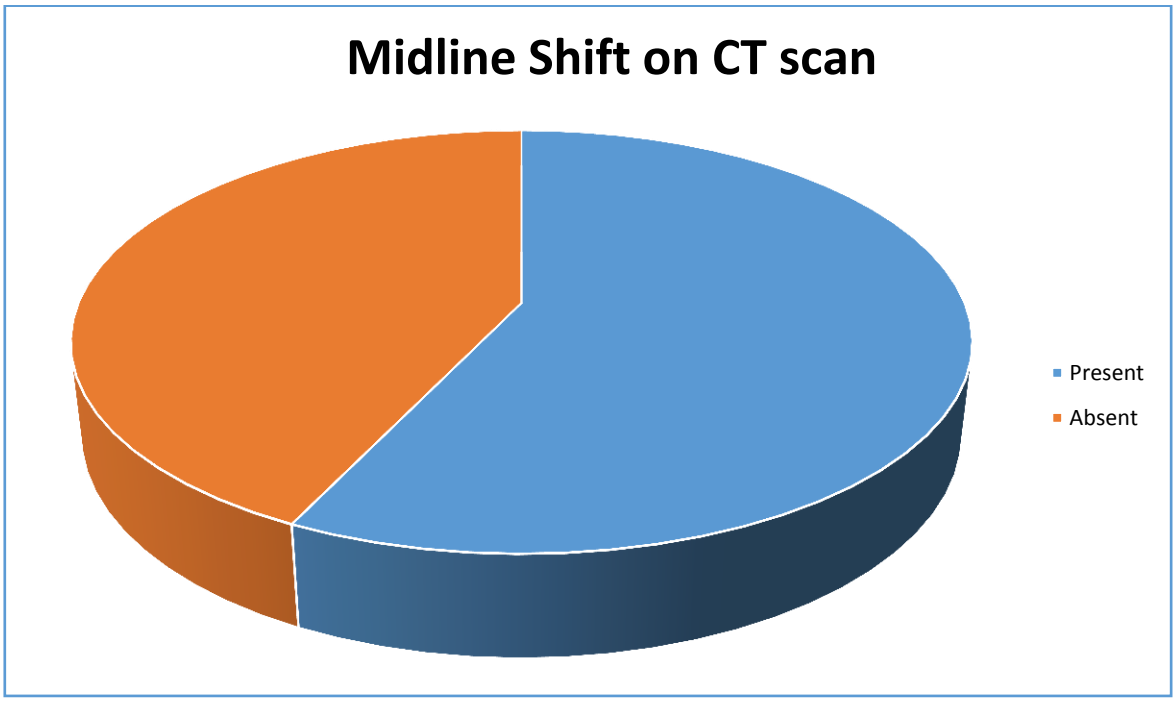

Fig. 10

Table 10: Incidence of post-operative symptoms

Post-op symptoms	**No of cases**	**% of cases**
Paresis	03	8.6
Headache	01	2.9
Seizure	00	0
Loss of consciousness	00	0
Difficulty in speech	00	0
Difficulty in walking	00	0
Total	**04**	**11.5**

In our study, the most common post-operative symptom observed was paresis seen in 3 cases(8.6%) and headache in 1(2.9%) cases.

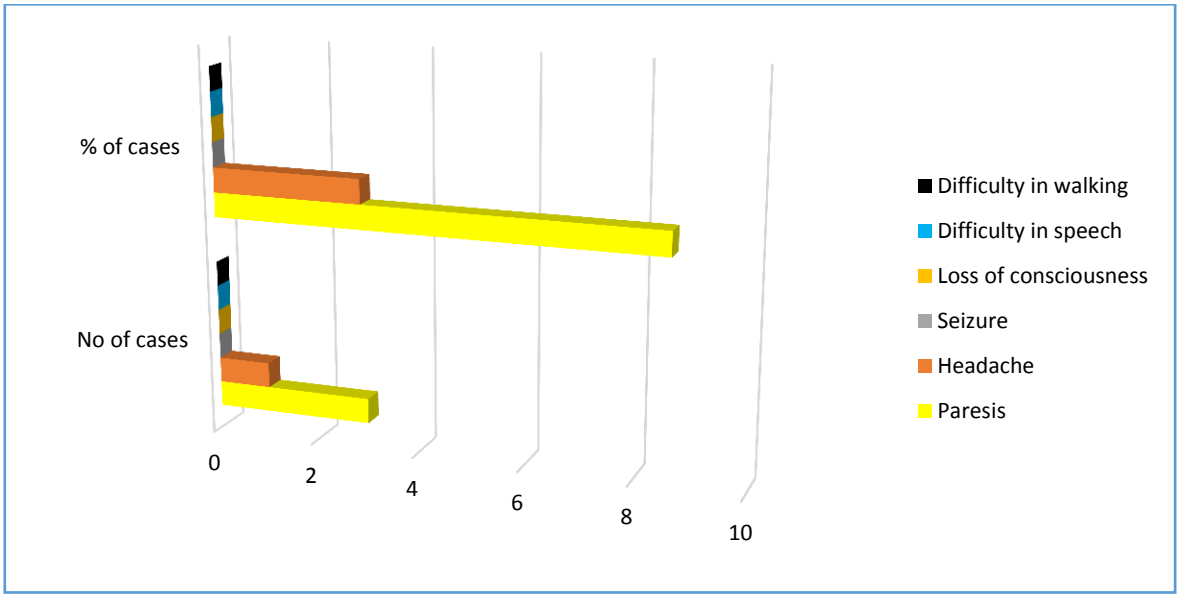

Fig. 11

Table 11: Incidence of re-exploration post burr hole evacuation

	Cases operated	Cases explored	Outcome (Good)	Outcome (Bad)
No of cases	35	4	35	0
% of cases	100	11.5	100	0

In our study, incidence of re-exploration immediately after burr-hole drainage was 11.5% seen in 4 out of the 35 operated cases.

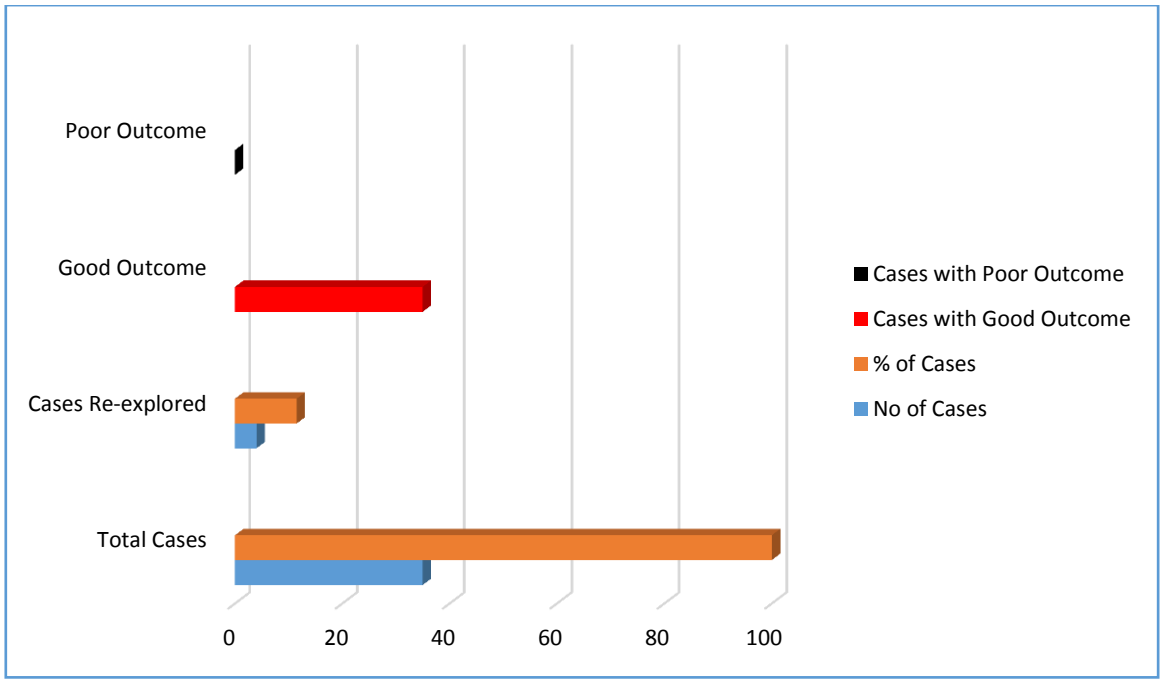

Fig. 12

Table 12: Outcome at 3 months after admission

Outcome	No of Cases	% of Cases
Poor		
Disability	0	0
Death	0	0
Good		
Full Recovery	35	100

All 35 patients had a good outcome after 3 months of surgery.

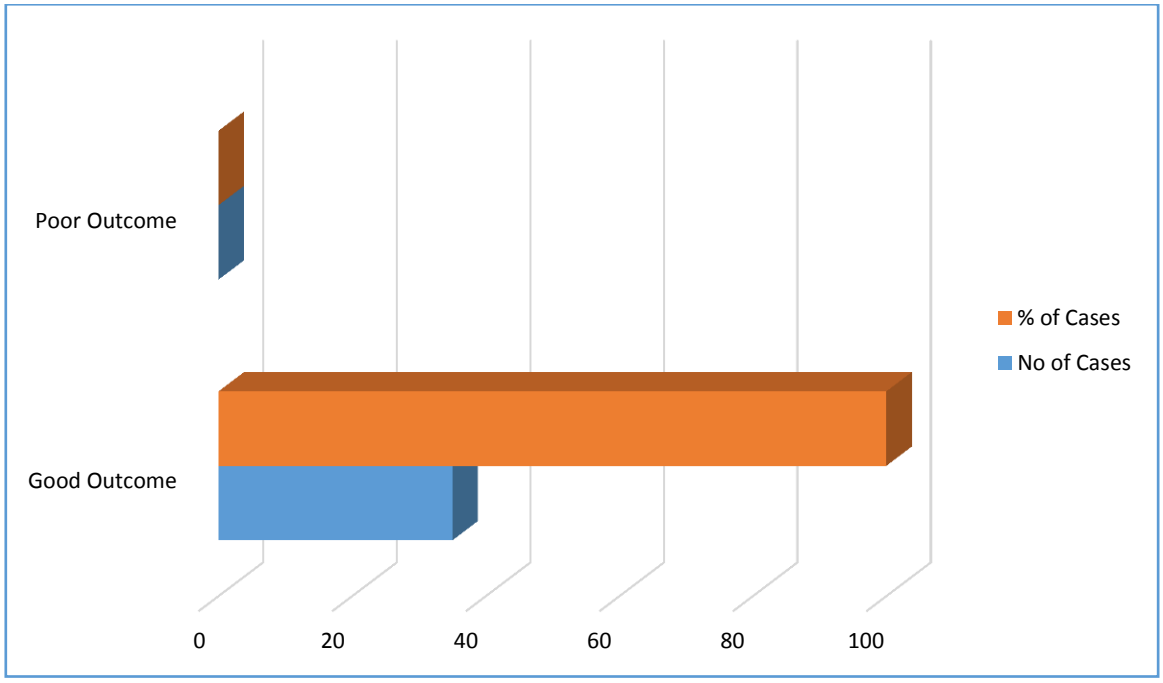

Fig. 13

Discussion

Chronic subdural hematoma is one of the most common clinical entities encountered in daily neurological practice. It occurs predominantly in elderly age group, usually after mild trauma. CT scanning has revolutionized the diagnosis and the condition is readily dealt within a neurological unit.

In our study of 35 patients of chronic subdural hematoma, 28 patients were males and 7 patients were females with a male; female ratio of 4:1. This is in accordance to the study conducted by Sambasivan M (1997) in which 2300 cases of chronic SDH were observed with a male; female ratio of 5:1.[43]

The age group of the patients in our study ranged from 45-90 years with mean age of 71 years. The maximum number of patients were in the age group range of 66-70 years and 81-85 years. This is in accordance to the study conducted by Asghar M et al (2002) in which the maximum number of patients were in the age group of 65-70 years. It is concluded that Chronic SDH is a disease of the elderly.[1]

In our study out of the 35 cases, 20 (57.14%) cases developed SDH after trauma(due to fall) and 15 (42.86%) cases developed spontaneous SDH. This is ion discoradance to the study of O'Brien DF et al (2000) in which 123 (61.5%) spontaneous and 77 (38.5%) traumatic cases of chronic subdural hematoma were observed.[34]

The most common presenting complaint of patients seen in our study was hemiplegia/hemiparesis (74.2%) followed by headache (42.8%). This is in discordance to the study conducted by Fogelholm R et al (1975) in which 109 patients were studied and headache was found to be the most common symptom, seen in 60% cases.[12]

In our study 28.6% cases were found to have bilateral hematoma. This is in discordance to the study conducted by McKissock et al (1960) in which 15-20% cases were bilateral.[27]

The most common post-operative complication observed in our study was reaccumulation of hematoma seen in 4 (11.4%) cases. This is in cordance to the studies conducted by Baechli wt al (2004) and Tindall et al (1976) who reported 10-15% cases of reaccumulation of hematoma. It is concluded that reaccumulation of hematoma is the most common post-operative complication.[2,48]

In our study out of 35 patients 27 (77.2%) had GCS score of 15. These patients were discharged home earlier post-operatively, with good outcome. This is in accordance to the study conducted by Chen CW et al (2004) in which poor outcome was observed in patients with thick density type of lesion on CT scan.[5]

In our study surgical outcome was good in 100% cases. This is in accordance to the study conducted by Maurice and Williams (1999) which showed that surgical outcome was good in 90-100% cases.[25]

In our study 0% surgical mortality was observed which is in accordance to the study of Rhode et al (2002) in which <5% surgical mortality was observed. It is concluded that surgery is the best treatment option of chronic SDH.[40]

In our study, the recurrence rate observed was 0%. This is in discordance to the study conducted by Krupp and Jans (1995) which showed 20-30% recurrence rate. Recurrence is especially seen if fluid drainage is less than expected or pre-operative imaging studies suggest a basal layered collection.[18]

Summary and Conclusion

Surgical treatment of chronic subdural hematoma – Clinical characteristics, surgical outcome, complications and recurrence rate were studied during a period of 2 months between 1st June, 2020 and 31st July, 2020 at GMC Jammu.

The mean age of patients was 71 years, 51.4% cases belonged to age group of upto 70 years. 25.7% cases belonged to 8th decade of life and 22.9% belonged to 9th decade of life. Youngest age group is from 46-50 years and oldest age group is from 81-85 years.

- Weakness of part/parts of body (74.2%), difficulty in walking (51.4%) and headache (42.8%) were the most common presenting symptoms with which the patient presented to the hospital. The symptoms improved post-operatively.

- Due to availability of investigations such as CT scan and MRI, the confirmation of diagnosis has significantly improved.
- 26 cases had fronto-parietal lesion, 4 fronto-parieto-temporal lesion, 2 fronto-parieto-occipital, 2 fronto-temporal and 1 frontal lesion. All patients had good post-operative outcome.
- 18 cases had <10mm thick lesion on CT scan, 12 cases had 10-20 mm thick lesion on CT and 5 patients had >30 mm thick lesion. 20 patients had midline shift on CT scan.
- It was concluded that the site of lesion, midline shift does not affect outcome.
- Outcome was not affected by the presence of unilateral hematoma which was seen in 25 cases or bilateral hematoma which was seen in 10 cases. Outcome was good in all the cases.
- 27 cases had GCS score of >13 and 8 patients had a GCS score of <13. All the patients had good outcome postoperatively.
- Etiology of chronic SDH did not affect the outcome whether it developed spontaneously or after trauma.
- 4 cases were re-explored due to reaccumulation of hematoma which presented with weakness and headache post burr-hole drainage.
- No recurrence was observed in our study.

0% mortality was observed in our study.

Ethical approval

The study was approved by the Institutional Ethics Committee.

List of abbreviations

SDH – Subdural Hematoma
CSF – Cerebrospinal Fluid
CT – Computed Tomography
MRI – Magnetic Resonance Imaging
DIC – Disseminated Intravascular Coagulation
OT – Operation Theatre
GCS – Glasgow Coma Scale

Conflicts of interest

None declared

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Authors' contributions

VKG performed the operative interventions. AG analyzed and interpreted the patients' data regarding the surgical management of Chronic SDH. Both the authors read and approved the final manuscript.

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