CHRONIC SUBDURAL HAEMATOMA IN KENYAN ADULTS AT THE KENYATTA NATIONAL HOSPITAL: CLINICAL PATTERNS, RISK FACTORS AND IMMEDIATE POST OPERATIVE OUTCOME.

A PROSPECTIVE STUDY BY,

DR. GODFREY BARASA WASIKE(MBCHB):

A DISSERTATION SUBMITTED IN PART FULFILLMENT FOR THE DEGREE OF MASTER OF MEDICINE(NEUROSURGERY) OF THE UNIVERSITY OF NAIROBI

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DECLARATION

This dissertation is my original work and has not been presented for a degree in any other university.

Signed ---------- Date ----------

Dr Godfrey Barasa Wasike(MB ChB)

This dissertation has been submitted for examination with approval of university supervisors.

Prof. Nimrod Juniahs Mwang'ombe

Chairman Department of Neurosurgery and Thematic head of Surgery

University of Nairobi

Signature ……..Date……

Mr. C.K Musau

Lecturer and consultant Neurosurgeon,

Department of Neurosurgery

University of Nairobi

Signature……..Date……..

Mr Akuku

Lecturer and consultant Neurosurgeon,

Department of Neurosurgery

University of Nairobi

Signature…… ..Date……

DEDICATION

I would like to dedicate this work to my parents for their love and support,Prof Leland Albright for showing me the greatness of humility in service to God and man, the late Dr Geoffrey William Griffin for reminding me that the path of duty is the way to glory.

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I first acknowledge my Almighty father for giving me life and good health during the period of the research work.

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ABBREVIATIONS

ERC:	Ethical Research Committee
A/E	Accident and Emergency unit
KNH:	Kenyatta National Hospital
UON:	University of Nairobi
WHO:	World Health Organization
NSOPC	Neurosurgical outpatient clinic
CT SCAN	computer tomographic scan
CSDH	chronic subdural hematoma
CSD	Closed system drainage
TDC	Twist drill craniostomy
BHC	Burr hole craniostomy
COPD	chronic obstructive pulmonary disease
HIV	Human immune deficiency virus
WHO	World health organization
VPS	Ventricular-peritoneal shunt
TIA	Transient Ischemic attack
DOA	Date of admission
DOS	Date of surgery
DOD	Date of discharge/date of death
PR	Post Operative Recurrence Rate
CM	Centimeters
MLS	Midline shift

SUMMARY

Chronic Subdural haematoma (CSDH) is a collection of old blood between the dura and the arachnoid membrane caused mostly by the tear of bridging veins. As a condition it Presents a great disease burden with reported incidences ranging between 1.72 and 13.1 per 100,000 people[1]. The condition tends to afflict the elderly who suffer much larger bleeds due to the associated cerebral atrophy with increasing length of bridging veins[3.]

So the main aim of the study was to determine the clinical presentation, radiological patterns, risk factors and prognostic indicators for patients with chronic subdural hematoma seen in Kenyatta National Hospital.

Following ethical approval, 65 patients with CSDH who presented at KNH accident and emergency unit were consecutively recruited. Surgical intervention was two- burr-hole craniostomy without closed drainage system. Immediate postoperative outcome was done in the ward and then followed with post-discharge review at 2 weeks and one month at the neurosurgical outpatient clinics. Data was collected in pre-formed codified data sheets and analysis carried out using Statistical Package for Social Sciences (SPSS) version 17.0. Frequencies, means, median and interquartile ranges was computed for description of the various variables and presented in prose form and as pie charts and graphs. The association between categorical variables was calculated using Chi-square test while ANOVA was used for continuous variables.

In our study of the 65 patients,90.8% were men and elderly(29.2% in 7^{th} decade,18.5% in 8^{th} decade).The main clinical presentation was headache(83.1%)and confusion(72.3%) followed by neurological deficit(paresis 58.5%,aphasia 44.6%,loss of consciousness 43.1%).The main predisposing factors were trauma (70.7%) and alcohol intake (40%). Coagulopathy was only found in 13.8% and the rest of other known risk factors did not feature significantly. The most common radiological pattern was sub acute subdural(49.2%) followed by chronic (24.6%) with mean MLS of 6-15mm(84.6%),thickness of 10-20mm(56.9%)and volume of >50mls(83.0%).Good outcome was seen in majority of the patient after intervention(89.2%).And in multivariate analysis of prognostic indicators, old age(p=0.178),use of anticoagulant(p=0.247) and preoperative GCS of ≤5(p=<0.0001)were the most significant. The volume of bleed, midline shift or thickness of haematoma did not have significant impact to the outcome. For post operative complication two patients(3.1%)had recurrence of which one was empyema(1.5%),Three(4.5%) had seizures and two (3.1%)died. Significant positive correlation was found between recurrence and coagulopathy(p=0.005)and radiological pattern(both patients had acute on chronic subdural haematoma)

In conclusion, the major risk factors for CSDH is male sex,trauma,old age and alcohol intake. Low preoperative Glasgow coma scale,coagulopathy and old age are major determinants of poor outcome. Acute on chronic subdural haematoma and coagulopathy is associated with risk of recurrence.

INTRODUCTION

Chronic subdural haematoma (CSDH) is an encapsulated collection of old blood between the dura mater and subarachnoid caused by tear of bridging veins. Repeated bleeding from external membrane capillaries facilitated by fibrin degradation products leads to its expansion[7]. CSDH is fairly common disease, especially in the elderly with incidence ranging between 1.73 to 13.1[8] per 100,000 population. This population is also likely to have other associated co-morbidities that can impact on immediate postoperative outcome and overall survival.

Known risk factors for chronic subdural haematoma include coagulopathy, alcoholism, trauma and low intracranial pressures for example after lumbar drainage or ventricular peritoneal shunt.

Clinical presentation is varied but patient commonly presents with headaches, confusion, drowsiness, vomiting, seizures, ataxia among other presentations and on examination, patient have various neurological deficits including a low Glasgow coma scale, ophthalmoplegia, hemi paresis/hemiplegia among other deficits.

Diagnosis is confirmed by non contrast CT scan head as study of choice although in some instances MRI may be indicated. The imaging pattern has a direct influence on post operative outcome especially in terms of recurrence.[25]

Management of this condition can either be conservative with use of low dose steroids or surgery. Surgical options are still controversial with no level I evidence for standard modality although burr hole craniostomy (BHC) is initially recommended due its high safety-effectiveness ratio. BHC with CSD (closed system drainage) has marginal benefit over BHC with irrigation in

terms of recurrence and hospital stay according to some studies[44]. However the latter is most cost effective, making it ideal in our resource constrained setup.

In our study we analyzed 65 adult patients with CSDH in terms of clinical presentation, radiological patterns, predisposing factors and related this to immediate post operative outcome after 2-BHC with irrigation.

LITERATURE REVIEW

Chronic subdural hematoma is collection of blood between the dura and arachnoid usually caused by tear of bridging veins[6]. Some literature however suggests it occupies intradural space as a result of disruption of dural border cell layer from deep patchy meninges[8].

Whereas aetiological factors for acute subdural hematoma are well known; that is, parenchymal laceration that mainly affects fronto-temporal regions and tear from bridging veins both of which result from major head trauma and less commonly minor trauma in coagulopathic patients; 50% of chronic subdural have no identifiable cause[8] .However they are commoner and larger in elderly who have cerebral atrophy with consequent increased length of bridging veins which are also brittle[2,9].In some studies however, like in a series of 21 cases of spontaneous subdural hematoma, underlying causes included hypertension (7cases) AVM, neoplasm, infection, alcoholism and innocuous insult[10,11].The aetiological factors in our local setup however was largely unknown.

Although the risk factors for patients presenting in our hospital is unknown, studies done elsewhere have shown the following to be some of the risk factors.

Extreme of ages- infants have large dural space hence are more predisposed to interhemspheric SDH. They are also at risk of child abuse The elderly on the other hand have brain atrophy same as patients with degenerative neurological disease.Trauma as a predisposing condition has been diversely appreciated in literature. Lee et al(1998) noted in his series that acute subdural haematoma as a result of major head trauma turned to CSDH in 3%-6% of cases[12].However, minor head insult has been confirmed by different authors [13,14,15]to be a major predisposing factor. Stroobandt, in his study of 100 patients, found it be as high as 80%, compared to taking

aspirin(16%), coagulopathy(6%) and ethylism(11%)[50] .Patients who are prone to minor repeated trauma include those with convulsive disorders,hemiparetic patients(post CVA)or alcoholics(in addition to hypoprothrombinaemia)[25] .Other known risk factors include low CSF pressure conditions (for example after a lumbar puncture or after insertion of Ventriculo peritoneal shunt) and arachnoid cysts, especially in children[16]

Patient on anticoagulation have increased risk of up to 7 times in males and 26 times in females[17,18].The incidence of CSDH in this coagulopathic patients ranged from 10% to as high as 42% as found by different authors(Grisoli et al(1985)10%[10,15,17,18,16,12,11,14,19],Hardes et al(1981)18%[20],Reymond et al(1992)26%[21] while Koniq et al(1983) found 42% coagulation disorders in his series of 114 patients of whom 13% were alcoholic, 8% on salicylate with accompanying platelet aggregation abnormality,15% on warfarin and 6% had hematological/oncological diseases[18].In terms of assessment of coagulopathy, INR was found to be the best indicator in coagulation profile that included complete blood count, liver function tests, prothrombin time,activated partial thromboblastin time(aPTT), platelet count and fibrinogen level. In a multivariate analysis of risk factors in oral anticoagulation related to intracranial haemorrhage carried out by Berwerts and Webster(2000)[22] ,hypertension, INR >4.5 and duration of anticoagulation were found to be significant predisposing factors. More ever incidence of CSDH in patients on warfarin was found to be between 21%-36% .This rate was even higher (75%) for those with spontaneous CSDH[21,13].For this reason Doublis et al(1999) advices, stopping the warfarin with correction of INR by use of fresh frozen plasma(100ml/kg)

and factor K concentrate to achieve INR of 1.5 or less[2] before surgery and restarting it on third post operative day to achieve therapeutic INR of 2-3 for most conditions except for mechanical heart disease that requires higher INR of 3-4[4,24]

Clinical presentation of chronic subdural haematoma is varied. The common presentation in our local setup was largely unknown..However, common clinical presentations in the literature include presenting complaints of:Confusion/disorientation/personality changes;Headache which could be constant or fluctuating and associated with nausea or vomiting, blurring of vision, gaze palsy or ophthalmoplegia;Seizures which are mostly focal but could also be generalized;Dysphasia orslurred speech;Ataxia/inability to walk or motor weakness;Low level of consciousness or fluctuating level of consciousness(Transient ischemic like syndrome) and a history of recent head injury.

And on examination, patient will often have low level of consciousness like confusion, Drowsiness, signs of head trauma e.g. scalp laceration/bruises,Motor weakness with or without Pupillary defect and specifically for interhemspheric subdural haematomas,patient will have a constellation of paresis, focal seizures, gait ataxia,dementia,language disturbance and occulomotor palsy.

In terms of imagiging,CT Scan of the head is the preferred imaging modality for acute subdural hematomas and usually shows a crescent shaped hyper dense lesion crossing suture lines.Normura and colleagues(1994)[26] divided chronic subdural into five types based on CT scan findings as follows;

- a. High density
- b.Mixed density
- c.Layering type

} they were found to be active with high tendency to rebleed

- d.Isodense type
- e.Low dense type: they were found to be most clinically stable

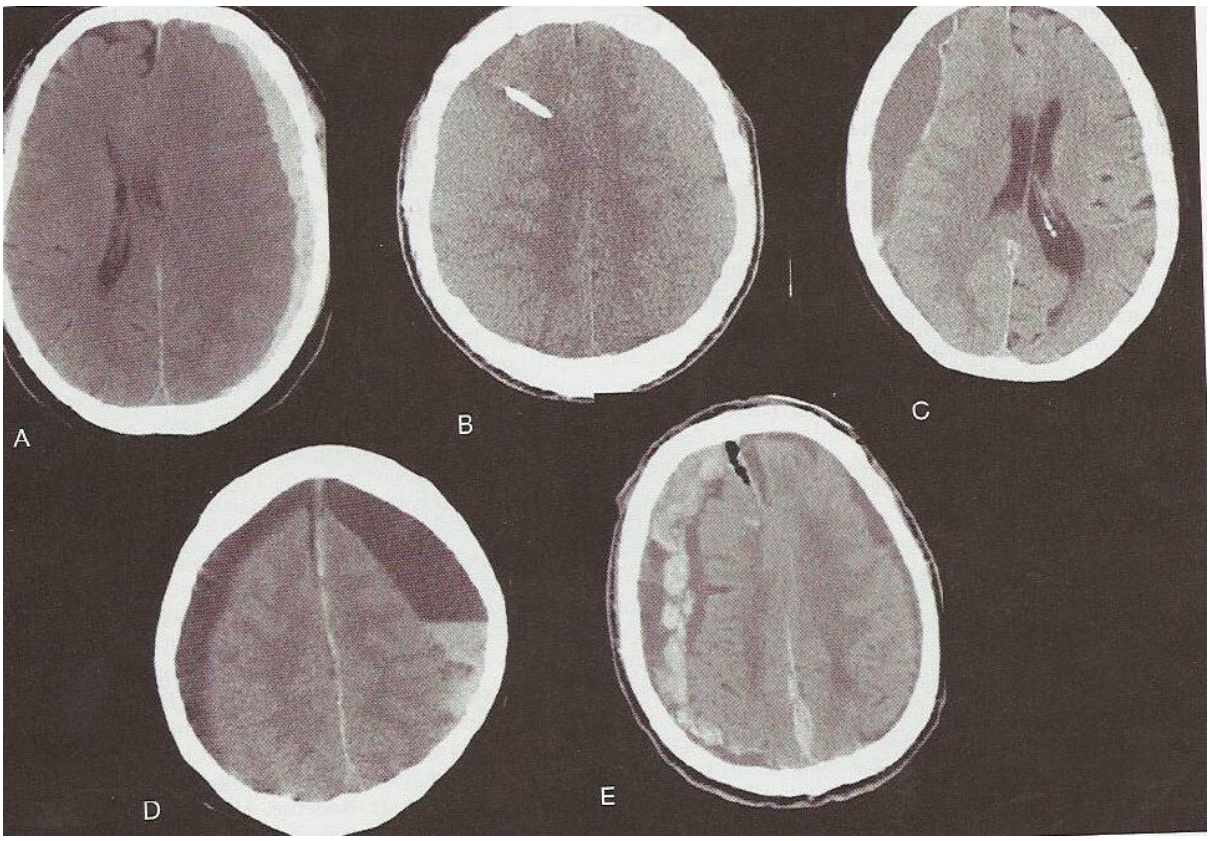


Fig 1.CT scan findings as outlined by Normura et al [26]

A. hyperdense.B.isodense C.low density D.mixed density E.layering type

This was confirmed by Stansic et al(2005) in relation to post operative recurrence[3] .see fig 2.

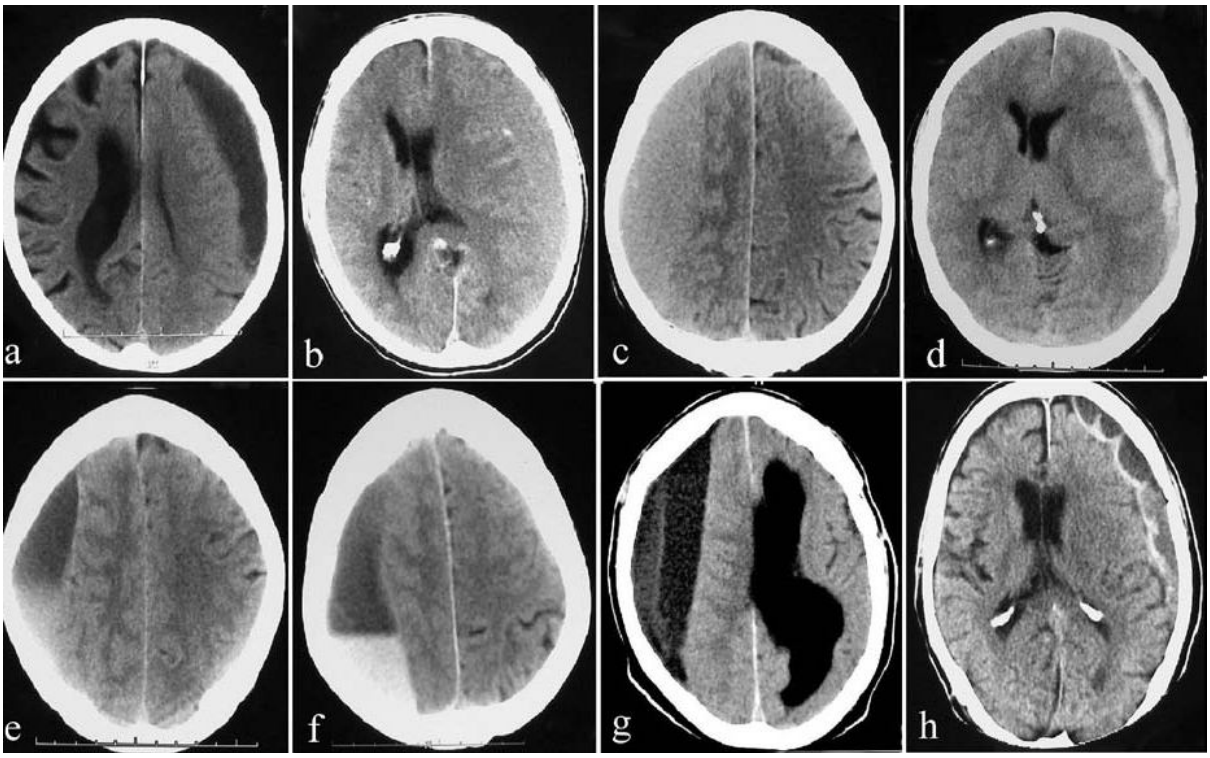


Fig 2.CT scan findings in relation to recurrence by Stansic et al [27]
CT scans of CSDHs according to their internal architecture. **Homogenous density type**: a) Low density subtype (PR rate 5.1%), b) Isodensity subtype (PR rate 11.8%), c) High density subtype (PR rate 0%), d) Laminar density type (PR rate 26.7%); **Separated density type**: e) Gradation subtype (PR rate 0%), f) Separated in coronal plane (PR rate 43.8%), g) Separated in saggital plane (PR rate 0%), h) Trabecular density type (PR rate 18.8%)

In our study we sought to find the percentage of our patients with the specific patterns and how it related to the post operative outcome including recurrence rate. We also compared the outcome based on the two patterns as classified by Normura and Stansic.

MRI is more useful after 48 hours to asses extent of brain injury, the intradural location, its multiple compartment and the probable age of the haematoma.CT scan may also not depict well the 25% of cases that are isodense to brain or severe cerebral atrophy that can leave

prominent subarachnoid space.The imaging characteristics of the MRI differs from the CT scan findings as shown on the table below.

Type of bleed	Approx time	Blood product	T1	T2	CT Scan
hyper acute	0-6hrs	oxyhaemoglobin	isointense	isointense	hyperdense
Acute	6-3days	Deoxyhemoglobin (intracellular)	Isointense to hyperintense	hypointense	hyperdense
Early subacute	3-7days	Deoxyhemoglobin extracellular	hyperintense	hypointense	Iso to hypperdense
Late subacute	7-14days	methemoglobin	hyperintense	isointense	Iso to hypodense
Chronic	>14days	hemosiderin	hypointense	hypointense	hypodense

Table 1:Mri characteristics of CSDH compared to CT Scan

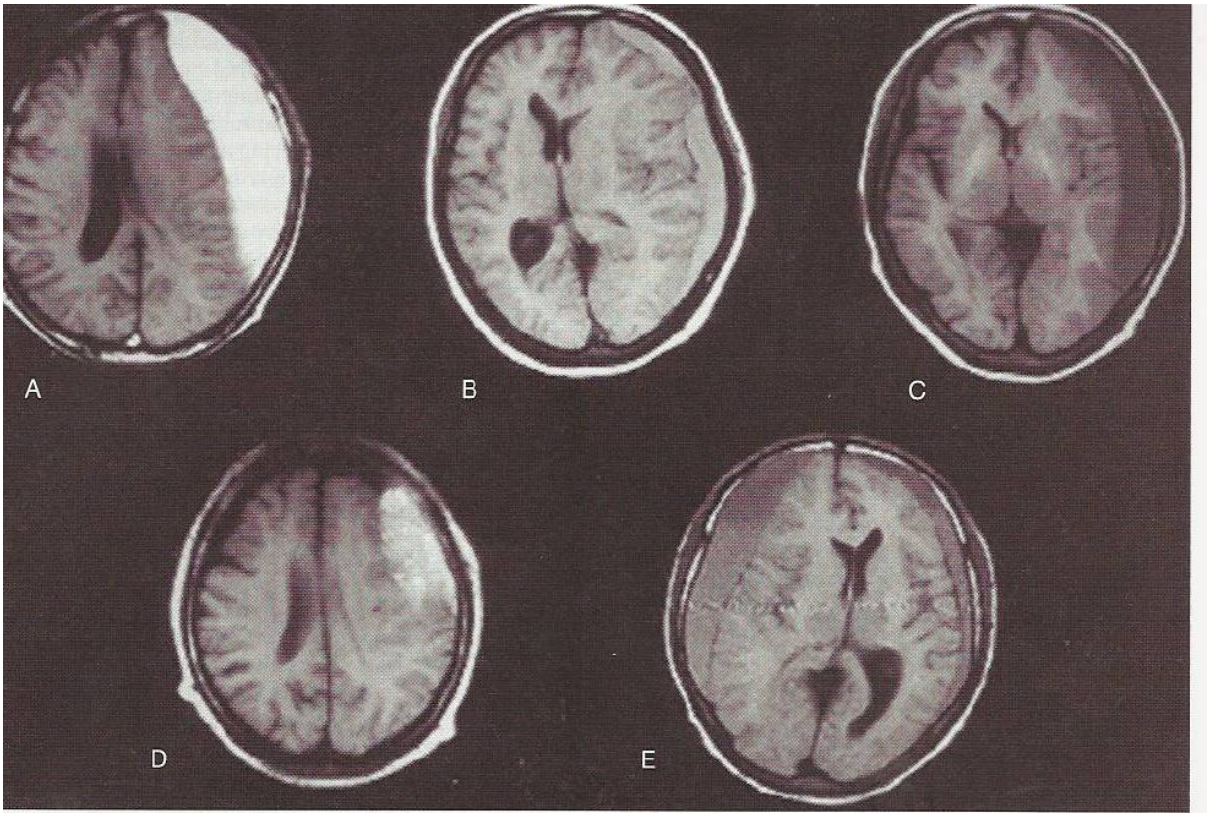


Fig 3.Mri classification of CSDH by Tsutsumi et al [28]

A.hyperintense B.isointense C.hypointense D.mixed hyperintense/isointense E.mixed iso/hypointense(pictures adapted from Schmideck text book of neurosurgery)

Based on this MRI findings,Tsutsumi et al studied 230 CSDH patient and classified them into 5 groups based on T1 findings(hyper;hyper/iso,iso,iso/hypo and hypointensity).Recurrence was found to be lowest in hyper intense group(3.4%) compared to the rest(11.6%)[28] .Due to the high cost of MRI,it is not readily available in our local setup unless in special circumstances where CT scan head is not diagnostic. In our study, we sought to know the percentage of the patient with chronic subdural haematoma that would need MRI to confirm the diagnosis.

As pertains to the management of this condition, there is no uniform agreement on best method of treatment of chronic subdural hematoma[20, 29,30,31,32.] Surgical options include:

1.Two standard burr holes placed on same line as trauma flap followed by saline irrigation using soft Jacques catheter.

2. A large burr hole (2.5cm) i.e. sub temporal craniectomy with gel foam placed into the opening. This allows content to drain into sub temporal muscle

3. Single burr hole with subgaleal drain left in situ for 24-48hrs when the output is negligible. In some studies, it has been shown that the drain reduced recurrence rates from 19% to 10%.[33].

4.Twist drill craniostomy(5mm) with subdural drainage.This however has high recurrence rates than the conventional burrhole.The advantage of twist drill though is that it decompresses the subdural space slowly; thus avoiding rapid pressure release that can lead to cortical hyperemia or even intracerebral hemorrhage. The ventricular catheter is usually placed into subdural space and then connected to reservoir placed 20cm below head [33,37,38]and patient is instructed to lie flat post operatively for 24-48hrs.

Comparing the three main methods that are usually employed in management of this condition(ie 1,3 an 4 above) in a study done by William et al[39] ,they found out that the patients who underwent twist-drill and closed system drainage (CSD), 43% of them had smaller lesions on follow-up CT scans, as compared with 74% of those who underwent the burr-hole only procedure, and 65% with burr-holes with drains. Clinical outcome showed that 64% of twist-drill and CSD patients deteriorated as compared with 16% of those with burr-hole only and 7% with burr-holes and CSDs. Sixty-four per cent of twist-drill patients required repeat evacuations as

compared with 11% of those with burr-holes only, and 7% with burr-holes plus drains. Hospitalization days was also longer as found out by Okada Y et al; 14.1 days in the drainage group and 25.5 days in the irrigation group[4].Twist drill(TDC) however had better outcome when CSD was combined with suction reservoir and outcome was actually comparable to burr hole drainage(BHC) in terms of length of hospitalization, recurrence rate, mortality, and neurological recovery and better still, a repeat CT scan done at two months showed complete regression of subdural effusion in 66.6% of cases in the TDC group compared to 31.8% in the BHC group ($P<0.05$)[41.]

According to Emastus R.I burr hole craniostomy with closed-system drainage should be the method of choice for the initial treatment of CSDH, even in cases with preoperative detection of neomembranes. Craniotomy should be carried out only in patients with reaccumulating hematoma or residual hematoma membranes, which prevents expansion of the brain[42]. Even then, according to Lee J's[43] retrospective study which was performed on 172 patients with CSDH, comparing the efficacy of three different primary surgical methods; rate of reoperation in the group of burr-hole drainage was 16%, slightly lower than in partial membranectomy with enlarged craniectomy(18%) or extended craniotomy(23%).This is reaffirmed by literature review done by Wigel et al (2001) where although there was no article that provided class I evidence, Six articles met criteria for class II evidence and the remainder provided class III evidence. Evaluation of these results showed that twist drill and burr hole craniostomy were safer than craniotomy; and although burr hole craniostomy and craniotomy were the most effective procedures; burr hole craniostomy had the best cure to complication ratio (type C recommendation). Irrigation lowered the risk of recurrence in twist drill craniostomy and

did not increase the risk of infection (type C recommendation). Drainage reduced the risk of recurrence in burr hole and twist drill craniostomy, and the use of a drain did not increase the risk of infection (type C recommendation). However Burr hole craniostomy appeared to be more effective in treating recurrent haematomas than twist drill craniostomy, and craniotomy was considered the treatment of last choice for recurrences (type C recommendation)[44]

For the burr hole craniostomy, the number of bur holes is an independent predictor of recurrence. This is according to a retrospective study done by Taussky P consisting of 97 haematoma. 63 (65%) haematomas were treated with two burr holes, whereas 34 (35%) were treated with one burr hole. Patients with one burr hole had a statistically significant ($p < 0.05$) higher recurrence rate (29 vs. 5%), longer average hospitalization length (11 vs. 9 days) and higher wound infection rate (9% vs. 0%) [45.]

The less invasive surgical technique is bedside percutaneous subdural tapping with spontaneous haematoma efflux after twist drill craniostomy under local anaesthesia.A prospective study done on 118 adult patients, 99 with unilateral and 19 with bilateral CSDH by Reinges MH[46] had a mean number of subdural tappings of 3.2. Ninety two of the patients with unilateral CSDH were successfully treated by up to five subdural tappings and 95% of the patients with bilateral CSDH up to 10 subdural tappings. The mean duration of inpatient treatment was 12 days. The only significant predictor for failure of the described treatment protocol was septation visible on preoperative CT. Thus, it can be recommended in all patients as a first and minimally invasive therapy, especially in patients with a poor general condition. However, Patients with septation visible on preoperative CT should be excluded from this form of treatment.

Post operative complication of CSDH include recurrence,tension pneumocephalus,seizures,empyema,intracranial haemorrhage,transient post operative clinical detoriation and death.

Symptomatic recurrence is appearance of neurological signs and symptoms with radiological increase in volume of CSDH within weeks or months that is different from residual collections.Infact according to one study, persistent fluid was seen in 78% of cases on post op day 10;15% day 40 and up to six months for complete resolution. Hence there is no treatment for recurrence unless CT Scan done at 20 days post operative show increase in size of haematoma and there is no clinical recovery or there is detoriation[36].

Recurrence rates vary between 3.7-21.5%[47, 48, 49]. Recurrence is higher in elderly patients[50]as found by Stroobandt et al(1995). This could be attributed to failure or extreme slowness of brain expansion seen in elderly patient[51,52] .According to Normura et al(1989) and Nakaguchi et al the separated type/layering type are associated with higher recurrence.[26,53] In fact Nomura et al. analyzed the concentrations of fibrinogen, fibrin monomer, and d-dimer in patients with “layering-type” CSDH and reported that the layering type of CSDH is active, has a high tendency to rebleed, and exhibits hyperfibrinolytic activity. This non homogeneity occurs as part of intermittent cyclic process of haemorrhage originating from external membrane capillaries favored by FDPs or as a consequence of new trauma.[54.]

Other factors predisposing to high recurrence include: coagulopathy, intracranial hypotension, intracranial air on post CT scan, alcoholism, seizures, cerebral atrophy, CSF shunts and bilateral surgery[55,56,57]. Placing patient in supine or upright position have no influence on recurrence rate[58] .Diabetes Mellitus is associated with low recurrence rate probably due to high osmotic pressure

and increased platelet aggregation. This hyper viscosity diminishes rebleed rate[59,60] .According to Stansic M et al(2005), the surgical factors, type of anaesthesia,site of initial surgery, use of drainage, duration and volume of drainage, post operative massive air collection and surgical experience of operators related to the initial procedure did not influence PR rates at significant levels[27].Tension pneumocephalus as apost operative complication is usually rare with rates varying between 1-2%.

The overall incidence of post-CSDH seizures varies from 2.3 to 17% [62] with a reported incidence of post-operative seizures between 1.0 and 23.4%[63]. Although one study has verified a significant increase in morbidity and mortality associated with respiratory complications and status epilepticus in patients with new onset seizures after CSDH, the efficacy of prophylactic anti-convulsive medication has been debated and its use is not consensual[62,64,65] .Lower mean GCS on admission is independently predictive of seizures, most of which occur within the first three months after CSDH[70] and in fact a decrease of one mean GCS increased the seizure rate by 21.6% according to a study done by Yu-Hua Huang et al(2011).Since the incidence of seizures vary widely in literature,we will seek to establish the true incidence, both preoperatively and post operatively and the likely risk factors.

Infection of subdural space is rare and may also occur with untreated CSDH[66].We will determine the incidence of subdural space infection, the common pathogens and the possible predisposing factors in our study.Intracerebral haemorrhage on the other hand is common in elderly (over 75yrs).It is thought to be as a result of rapid decompression leading to cortical hyperemia with subsequent risk of spontaneous intracerebral bleed [67].Incidence varies between 0.7-7%.It is associated with high mortality.(1/3 die and another 1/3 are severely disabled).Overall Mortality varies in literature from 1-8%. [34,48,15,53] .Age, general condition and

neurological grading are contributing causes. In this study we wanted to establish the mortality in our setup, and whether age, general condition and neurological status played a significant role. Another rare complication is post operative clinical detoriation, for example development of aphasia or hemi paresis but with negative findings on imaging. These kind of patient however,are known to responds well to short term treatment with mannitol[42]

2.3 STUDY JUSTIFICATION

The incidence of chronic subdural hematoma is high especially in the elderly who also have more co morbidities and are likely to have poorer post operative outcome. Two-burr hole craniostomy with closed drainage system is preferred surgical intervention although we still don't have level I evidence. The contribution of drainage system is however minimal according to literature hence in our resource constrained setup it cannot be indicated for all cases. Therefore this study sought to isolate those cases in terms of clinical profile and radiological patterns that didn't respond to burr hole craniostomy without closed drainage and may therefore require another surgical method of evacuation as an initial intervention.

OBJECTIVES

MAIN OBJECTIVE

To determine the clinical presentation, risk factors and radiological patterns of chronic subdural hematoma and relate it to post operative outcome.

SPECIFIC OBJECTIVES

1. To determine the common clinical presentation of CSDH in our local population
2. Determine specific risk factors for CSDH in the same population
3. Determine the radiological patterns of CSDH
4. To determine immediate post operative outcome of CSDH in terms of neurological status and complications.
5. To establish the predisposing factors to post operative complication.

PATIENTS AND METHODS

Study site

Kenyatta National Hospital (KNH)

- KNH Trauma and main theatre
- KNH radiology department
- Neurosurgical Unit(ward 4c)
- Intensive Care Unit

Study population

The study population comprised of all adult patients who were diagnosed to have chronic subdural hematoma that presented in KNH during the study period from May to August 2012.

Study design

The study design was a prospective cohort study. Patients who met inclusion criteria had their independent variables ascertained. Postoperative outcome were assessed immediately after surgery in the ward, and then two weeks and one month afterwards in the clinic. Relevant investigations were done as patients condition dictated.

3.5 Sample size

Sample size was obtained using fisher's formulae for prevalence

$$\frac{Z^2 * (p) * (1-p)}{m^2}$$

Where:

Where n = required sample size

p = estimated prevalence set at between 1.72 to 7.35/100,000 based on previous studies[6]

m = Precision with which to measure prevalence of the study, set at ± 5%

The $Z_{\alpha/2}$ is 1.96 representing a 95% confidence interval

Substituting in the above formula; the sample size ranged between 26-104 and since the local incidence was unknown; we used the average sample size of (26+104)/2=65.

All patients who fulfilled the criteria of the study were recruited until the number of the sample size was arrived.

Inclusion criteria

- Patients above 18years of age
- Patients with chronic subdural hematoma as per the clinical presentation and radiological confirmation
- Patients whose guardians had given informed consent to the study.

Exclusion criteria

- Patients with no CT scans
- Patients whose guardians refused to consent to the study
- Patients less than 18 years
- Patients who died before surgical intervention.

DATA COLLECTION

The questionnaire was tested prior to data collection using 20 cases and appropriate amendments made. The biodata, inpatient and outpatient numbers and date of admission presenting symptoms &signs, CT scan of all patients were obtained from patients' files in accident and emergency unit, ICU and neurosurgical ward. This was done by the principal researcher.

The in-charges of the concerned departments were informed both verbally and in writing by the researcher about the study and were requested to contact the researcher whenever a patient was admitted.

A questionnaire was used to extract the required information. This included:

- Study number (using numerical format for example 001 up to number 65) and hospital number
- Age in years was grouped –as below 20,21-30,31-40,41-50,51-60,61-70,71-80,81-90,over 90.
- Sex

Presenting complaints that included Personality changes,headache,seizures,motor weakness, fluctuating signs and symptoms(TIA like symptoms)were inquired from the caretakers.

The risk factors that included any recent history of head trauma, post lumbar puncture, use of alcohol, anticoagulant or anti platelet medication, risks for frequent falls (e.g. from epilepsy or post CVA hemiplegia)were diligently inquired and actively sought from old records if available

In the Past medical history we inquired any history hypertension, diabetes, COPD or renal disease

Neurological exam included Glasgow coma scale, cranial nerves and motor deficits, pupillary changes i.e. size and reaction to light on admission. While radiological patterns were graded based on CT scan findings that included: either bilateral or unilateral and the 5 classes based on Normura et al[26] and eight classes by stansic et al.The volume of the bleed was calculated using the formula AxBxC(for axial CT scans) where

A=vertical distance of the bleed in centimeter(cm)

B=thickness of the bleed in cm

C=number of slices with the bleed multiplied by slice thickness

The CT scans were interpreted by the researcher, collaborated by the CT scan report and further discussion with the radiologist was sought for when doubt existed.

Post operatively,the outcome assessment was done using two scales: Glasgow outcome scale and Markwalder CSDH prognostic score[67] (see appendix I)24 hours post operatively ,then 2weeks and finally one month post operatively

Complications such as clinical and radiological evidence of recurrence[48], infection, new onset seizures, and delayed clinical deterioration was also assessed. The recurrence of CSDH was defined as an increase in thickness of hematoma and a change in hematoma density on

follow-up CT scans within a month post-operatively or re-appearance of symptoms such as hemi paresis headache, or change of consciousness as indicated[53,69]

For quality control, the questionnaire was pretested prior to commencement of the study and appropriate changes were made. The principal investigator took specific medical history and conducted the necessary physical examinations.

ETHICAL CONSIDERATIONS

Informed consent was taken from the participating patients or their guardians and those who declined to participate in the study were excluded and given the same treatment as those who consented. Costs incurred were borne by the principal investigator and no extra cost was passed to the patients. Confidentiality of the participating patients was maintained at all times. Names and numbers obtained on the questionnaire were used only for purposes of follow-up where need arose.Questionnaires were kept in a lockable cabinet. Consent forms were kept in a separate file from questionnaires in a lockable cabinet. Only the researcher and data manager had access to the information collected. The soft information was kept in a password protected computer. Approval by the ethics and research committee of the KNH was sought before commencement of the study(see appendix II).Results obtained from this study will be published and made available for use by the members of the medical fraternity and other relevant policy formulaters.

DATA ANALYSIS

Data has been presented in tables, prose, graphs and pie charts. Statistical analyses were performed using the Statistical Package for Social Scientists (SPSS USA Inc) Version 17 .0. Data has been analyzed using descriptive statistics to display the characteristics of the patient i.e. Mean value, standard deviation (SD), median and interquartile range (IQR), and frequencies has been used to describe data distribution. A chi square test has been used to generate bivariate association between independent and dependent variables. Correlation regression has been used to show association between independent and dependent factors.

STUDY LIMITATIONS

1.This was a hospital based study and therefore it may not reflect the true picture of the general population.

2.Although it is prospective cohort study, recall bias may have impacted on the responses we got from the research subjects despite the fact that only the principal researcher obtained history and examined all patients. This is because most of the clients were confused or had impaired mentation.

4.0 RESULTS

Demographic characteristics

Majority of the cases were in 7th decade(29.2%)followed by 8th decade(18.5%).Decades below this were almost uniformly balanced. There was gender predilection with majority of the cases being men(90.8%),that translates to male to female ratio 9:1.

Age distribution

Variable	**Frequency (%)**
Age	
18-20	1 (1.5)
21-30	8 (12.3)
31-40	6 (9.2)
41-50	7 (10.8)
51-60	7 (10.8)
61-70	19 (29.2)
71-80	12 (18.5)
81-90	3 (4.6)
>90	2 (3.1)
sex distribution	
Sex	
Male	59 (90.8)
Female	6 (9.2)

Table 2:Demographic characteristics

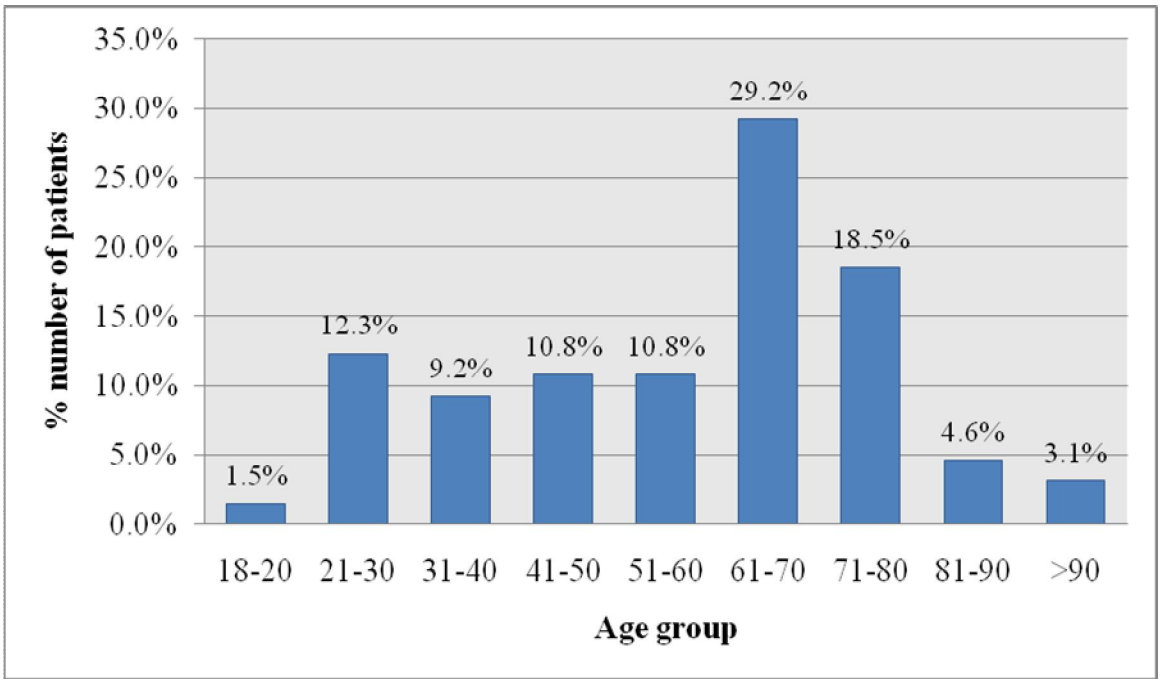


Figure 4: Age distribution

Sex distribution

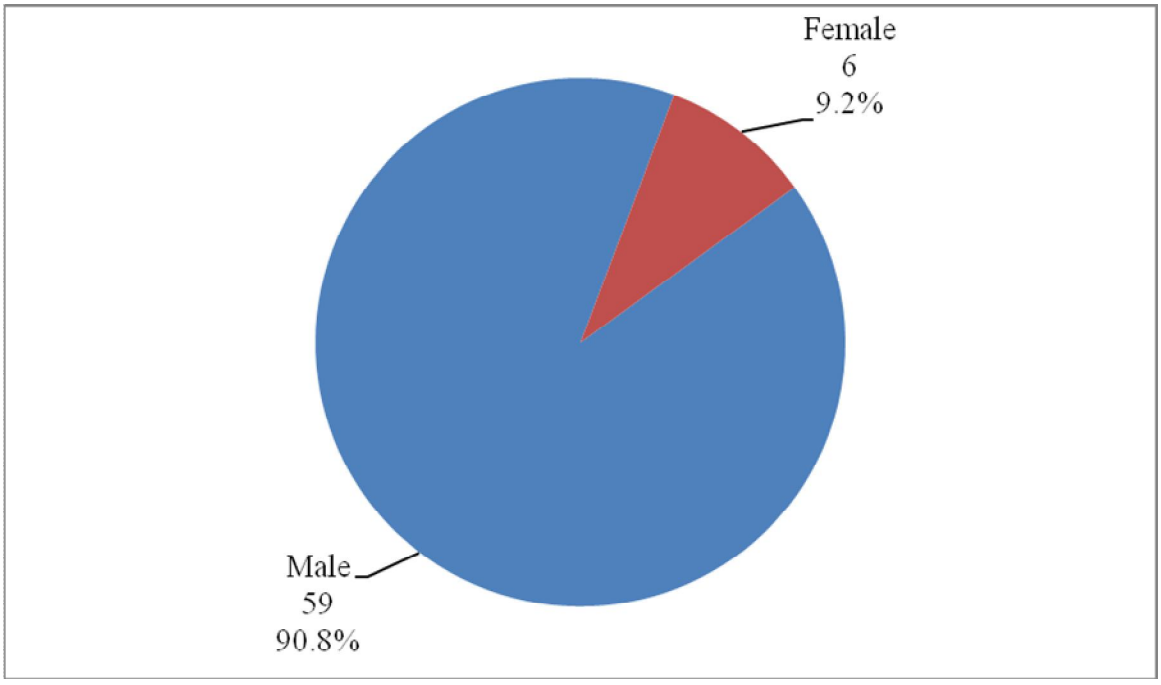


Figure 5: Sex distribution

Clinical presentation

Main symptoms that our patient presented with was headache(83.1%) and confusion(72.3%) followed by extremity weakness/paresis(58.5%) and positive history of head trauma(56.9%).Aphasia,loss of consciousness and vomiting come in third and the rarest presentation being convulsions and blurring of vision at 18.5% and 7.7% respectively.

Table 3: Presenting Complaints

Variable	Frequency (%)
Headache	54 (83.1)
Nausea/vomiting	21 (32.3)
Convulsions	12 (18.5)
Loss of consciousness	28 (43.1)
Blurring of vision	5 (7.7)
Paresis	38 (58.5)
Mono	20 (30.8)
Hemi	30 (46.2)
Quadri	4 (6.2)
Inability to talk	29 (44.6)
Confusion	47 (72.3)
History of head trauma	37 (56.9)

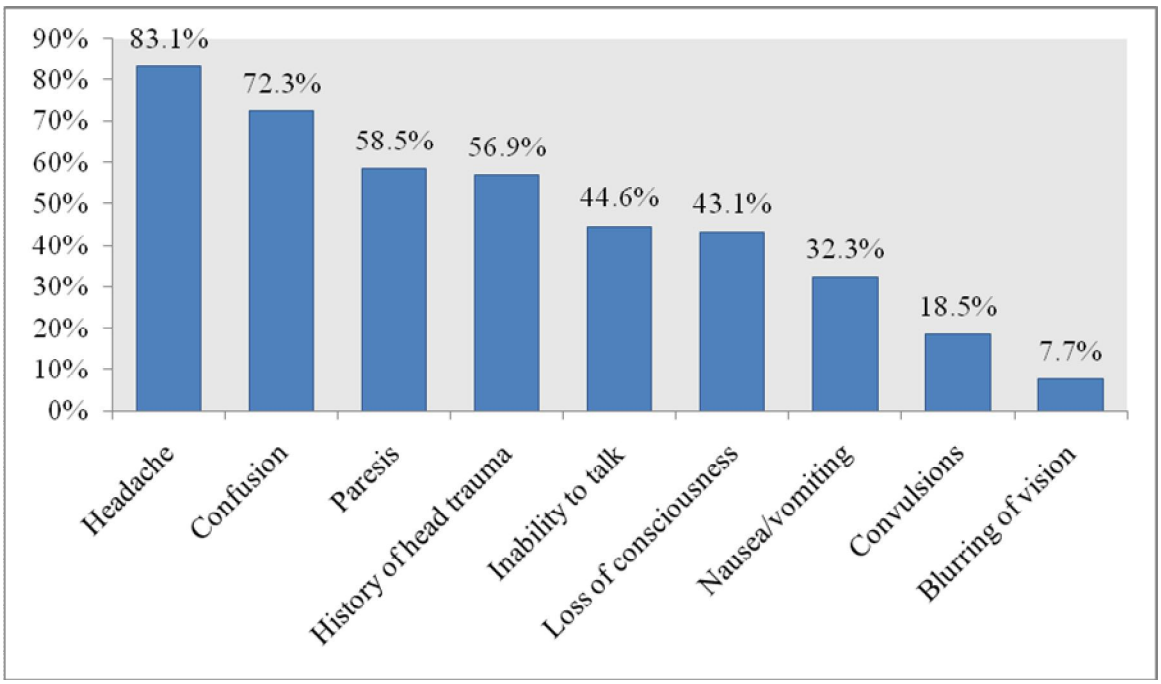


Figure 6: Clinical presentation

Risk factors

Of all the risk factors that have been associated with CSDH,trauma was commonest with 56.9% giving history of recent trauma. In addition 13.8% had a history of previous head trauma(total 70.7%),followed by alcohol at 40% and coagulopathy at 13.8% and then convulsive illness(10.8);use of anti platelet agent(6.5%).The rest of risk factors were found in less than 5% of the patient.

Variable	Frequency (%)
Convulsive illness	7 (10.8)
Cerebral palsy	1 (1.5)
History of CVA	2 (3.1)
Previous head trauma	9 (13.8)
Previous head surgery	2 (3.1)
Previous head injury with residual deficits	1 (1.5)
Alcohol use	26 (40.0)
Anticoagulant use	9 (13.8)
Anti-platelet agent	4 (6.2)
VPS shunting	nil

Table 4: Risk factors for CSDH

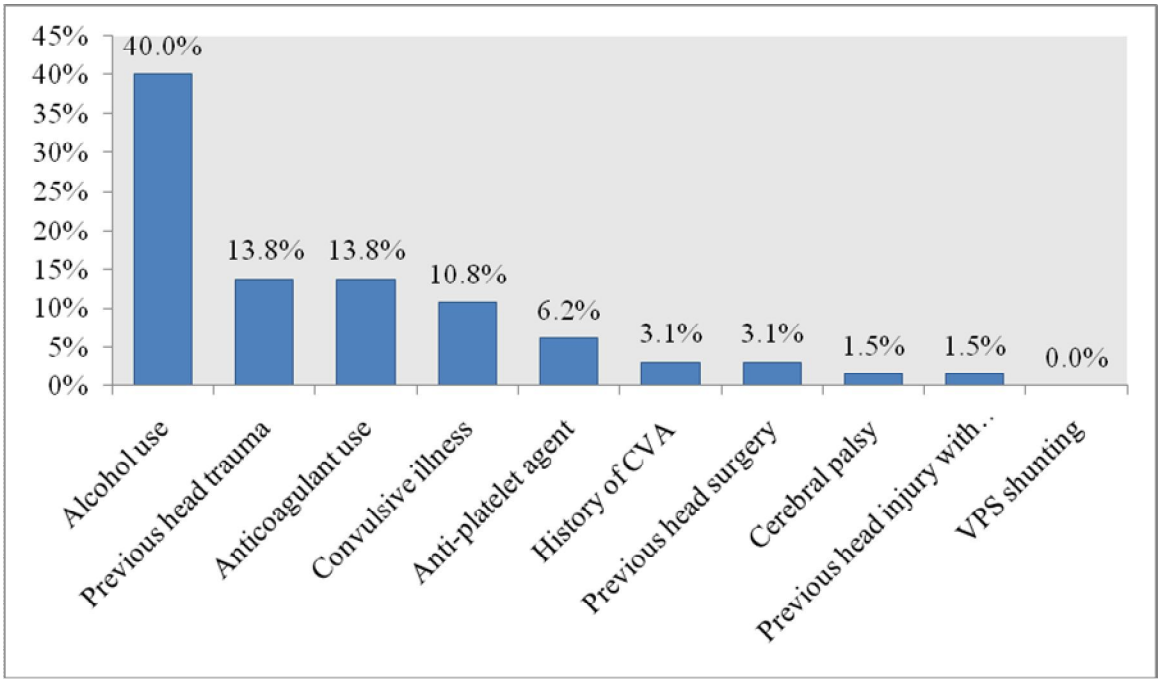


Figure7: Risk factors

Cormobidity

In terms of other underlying medical condition;hypertension was highest at 26.2% followed by diabetes at 23.1%,renal disease at 12.1% and lastly chronic obstructive pulmonary disease 7.6%

Table 5 cormobidity

Variable	Frequency (%)
Hypertension	17 (26.2)
Diabetes	15 (23.1)
Renal disease	8 (12.3)
COPD	5(7.6)

Pre operative neurological state

Majority of the patients had Glasgow coma scale of 14(30.8%)or 15(24.6%) followed by 10-12(21.5%) and then 6-9(12.3%) with very sick patient of less than 6 making up 6%.

Table 6 Preoperative GCS

Variable	Frequency (%)
Total GCS	
3	3 (4.6)
4	1 (1.5)
5	1 (1.5)
6	3 (4.6)
7	1 (1.5)
8	2 (3.1)
9	2 (3.1)
10	6 (9.2)
11	3 (4.6)
12	5 (7.7)
14	20 (30.8)
15	16 (24.6)

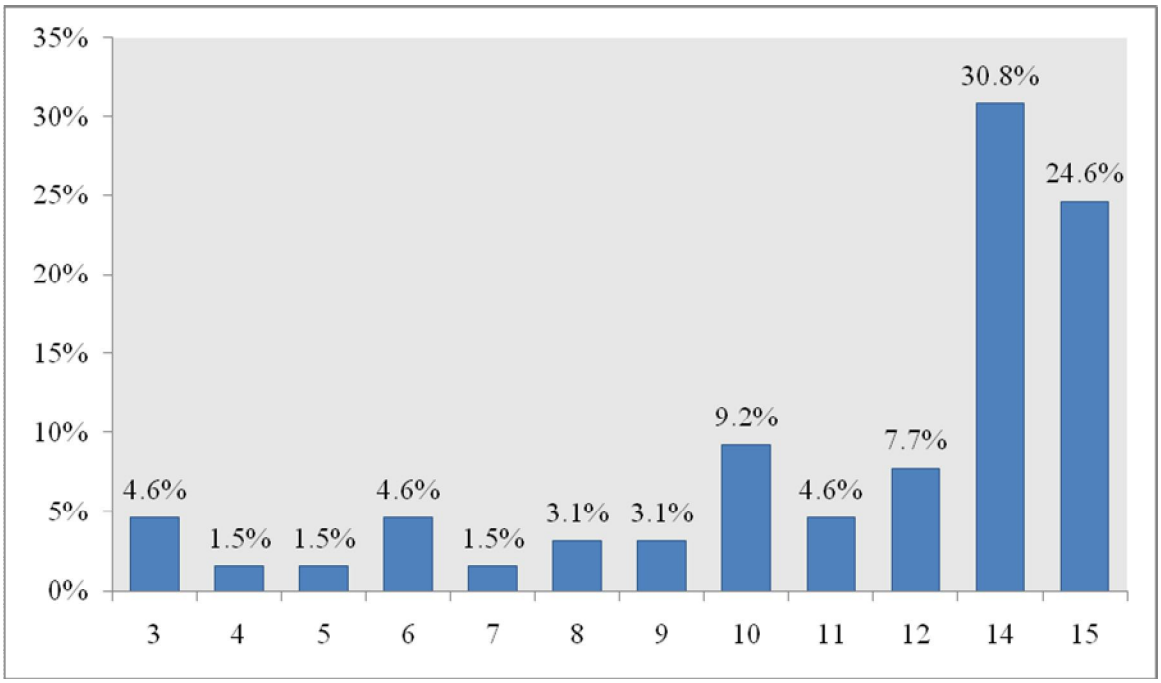
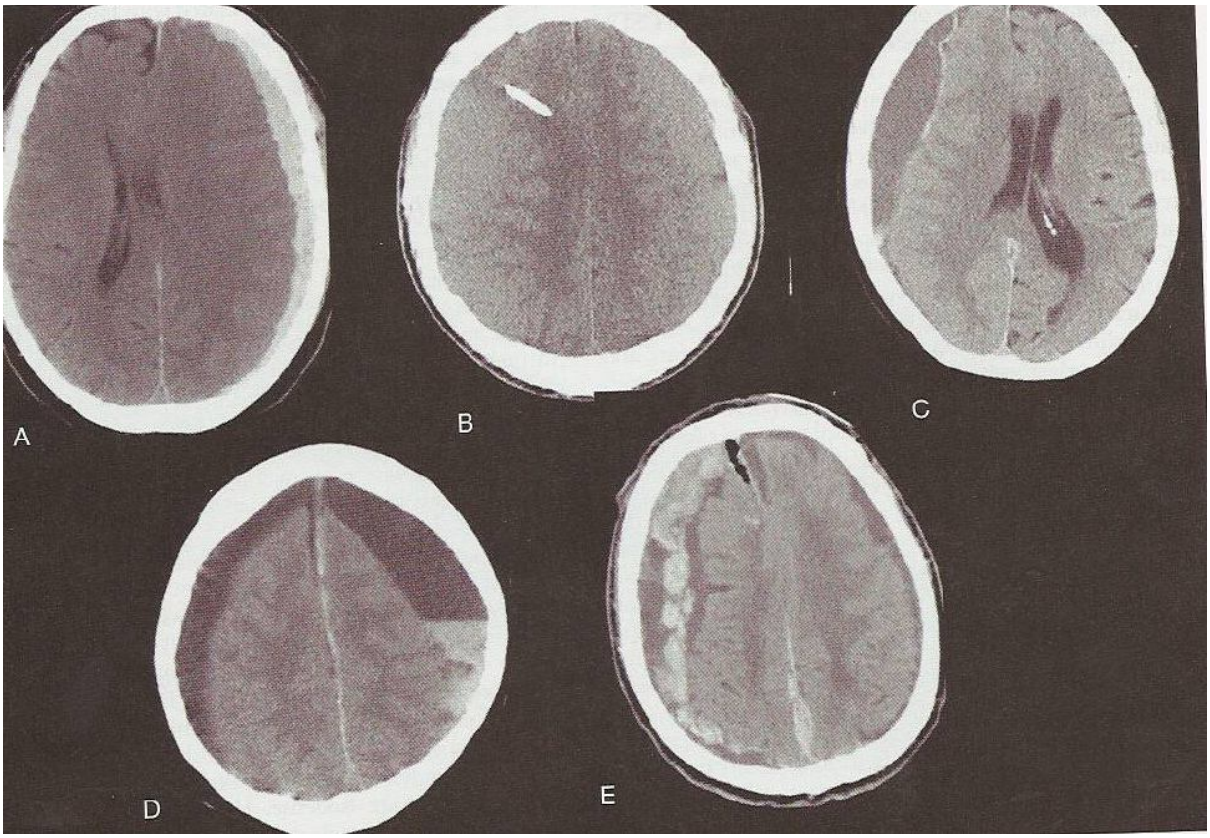


Figure 8:Pre operative GCS

Radiological pattern

CT scan was the main imaging modality. Only one patient was referred to us with an MRI in addition to CT scan. The common radiological pattern was sub acute subdural(normura B/stansic b&c)followed by chronic(normura C/stansic a).According to stansic classification, the sub classification of sub acute subdural in to two groups was difficult to clearly distinguish in our study, hence we treated the two groups as one. Over 90% of the patient had a significant midline shift of above 5mm ,with 6.2% presenting massive shift of over 16mm.Only 27.1% of patient had estimated thickness of CSDH of less than 10mm,and volume of less than 30mls.Infact almost a half of the patient(49.2%) had volume in excess of 100mls and 33.8% volume of 50-100mls) .



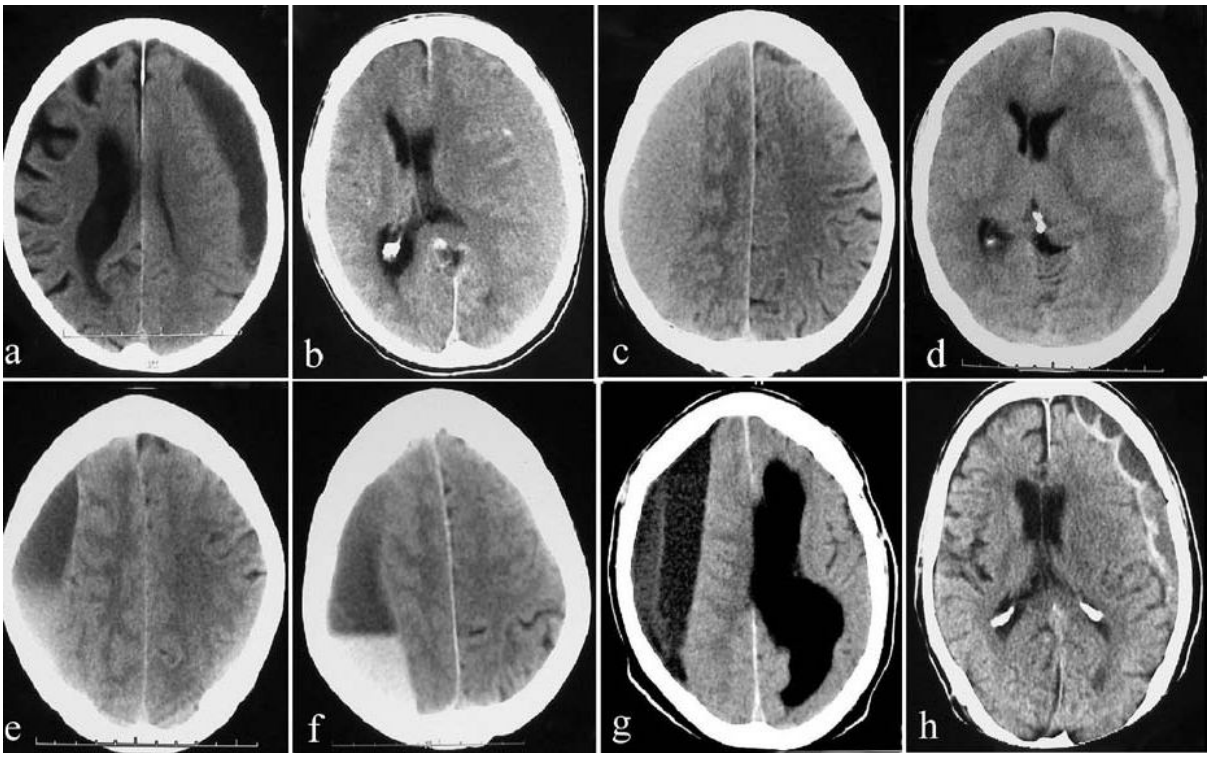


Fig 9:Radiological pattern

Table 7: CT scan findings

Variable	Frequency (%)
Normura class	
A	1 (1.5)
B	19 (29.3)
C	16 (24.6)
D	16 (24.6)
E	13 (20.0)
Stansic class	
A	16 (24.6)
B/C	21 (32.3)
D	5 (7.7)
E	5 (7.7)
F	7 (10.8)
G	7 (10.8)
H	4 (6.2)

Variable	Frequency (%)
MLS	
<=5 mm	6 (9.2)
6-10 mm	29 (44.6)
10-15 mm	26 (40.0)
>=16 mm	4 (6.2)
Thickness	
5-10 mm	18 (27.7)
10-20 mm	37 (56.9)
20-30 mm	8 (12.3)
>30 mm	2 (3.1)
Volume	
15-30 mls	5 (7.7)
30-50 mls	6 (9.2)
50-100 mls	22 (33.8)
>100 mls	32 (49.2)
Length of stay, median (IQR)	3 (2-5)

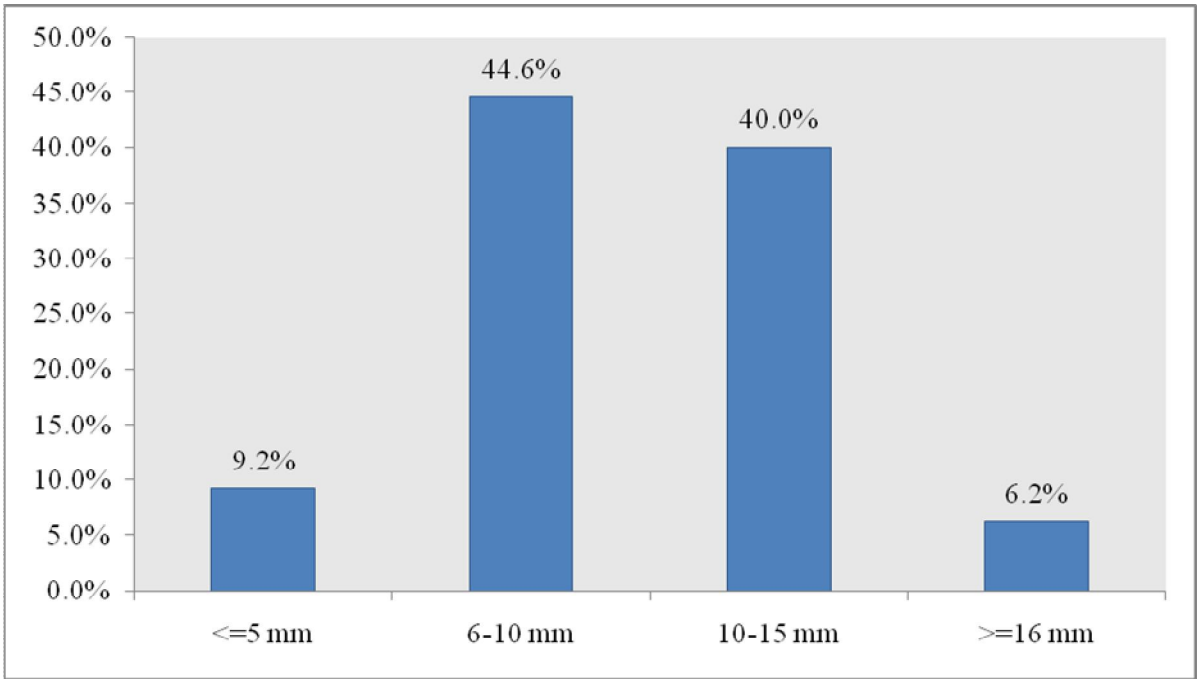


Figure 10: MLS from the mass effect of CSDH

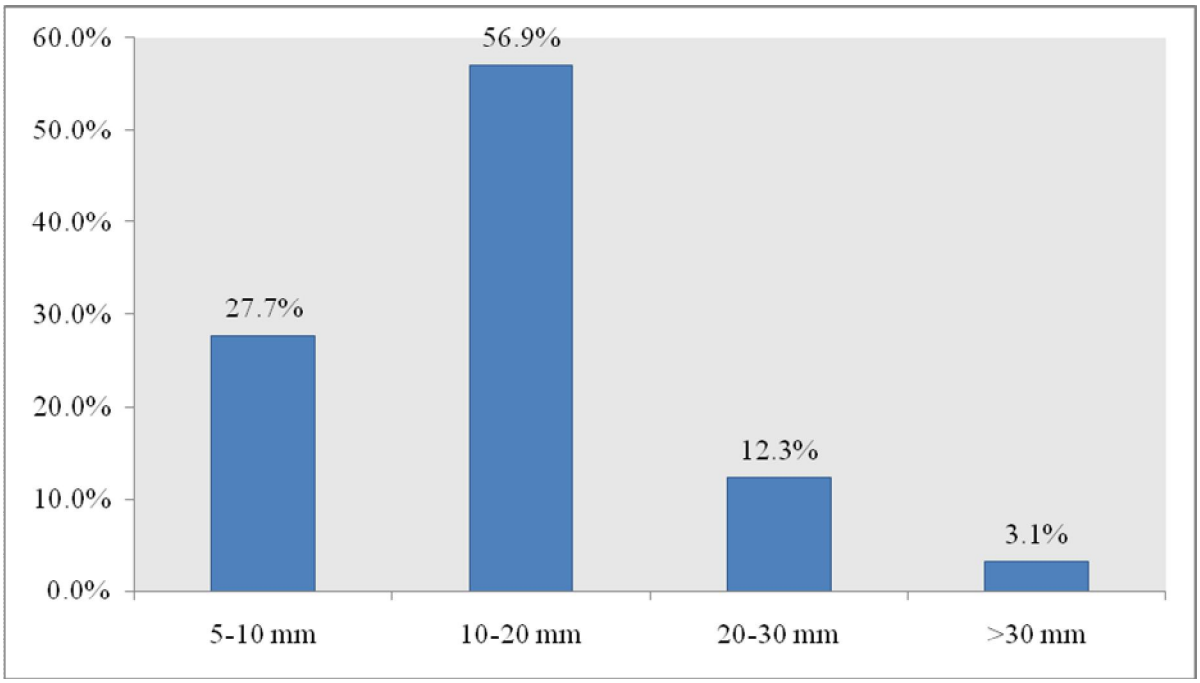


Figure11: Thickness of CSDH collection

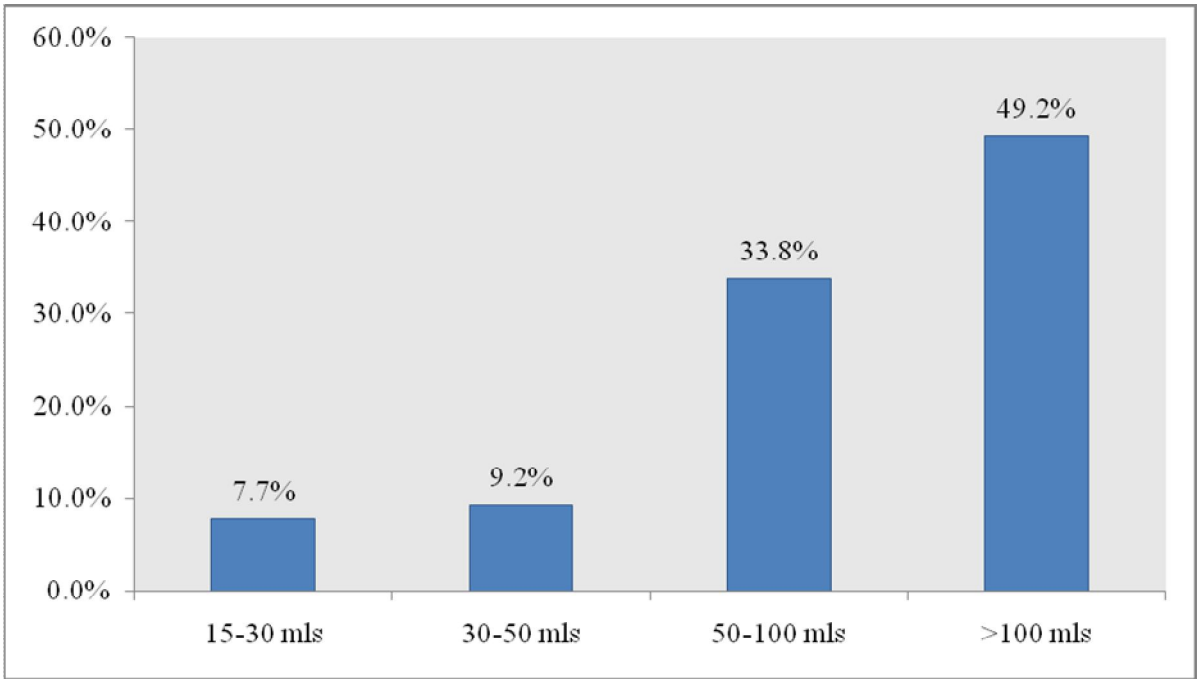


Figure 12: Volume of CSDH collection

Post operative Complication

Two patients (3.1%) had recurrence of which one was an empyema. The same patient had initial INR of >5 and was alcoholic. The microscopy and culture grew citrobactor sensitive to meropenem.Both patient had acute on chronic subdural haematoma, the graded type(Normura D/stansic f) and recovered fully after repeat burrhole and appropriate treatment for the one with empyema and coagulopathy.The volume of the bleed,or thickness or size of midline shift did not have statistical significance in terms of recurrence.

The Mortality occurred in two of our patient (3.1%).Both had a Glasgow coma scale of less than Five. One was 65yr male and the other 89yr female.The 65 yr old had a lower respiratory tract infection in addition. Of the three patient who developed seizures, one was 83yrs old male with hyponatremia(serum sodium of 116) and preoperative GCS of 6 and the other 67yr old ,hypertensive with frontal infarct in addition. The third patient was a known alcoholic with preoperative GCS of 4.All the three had a longer hospital stay of over two weeks compared to the mean of three days found in our study.

Variable	Frequency (%)
Recurrence	2 (3.1)
Death	2 (3.1)
empyema	1(1.5)
Seizures	3(4.5)

Table 8 post operative complications

Variable	Recurrence		P value
	Yes	No	
Thickness			
5-10 mm	1 (50.0)	16 (27.1)	1.000
10-20 mm	1 (50.0)	33 (55.9)	
20-30 mm	0 (0.0)	8 (13.6)	
>30 mm	0 (0.0)	2 (3.4)	
Volume			
15-30 mls	0 (0.0)	5 (8.3)	1.000
30-50 mls	0 (0.0)	6 (10.0)	
50-100 mls	1 (50.0)	20 (33.3)	
>100 mls	1 (50.0)	29 (48.3)	

Table 9 Radiological pattern vs recurrence

Post operative outcome

Favorable outcome was seen in majority of the patient(89.2%).In multivariate analysis of factors predisposing to poor outcome, old age(p= 0.178),use of anticoagulant(p=0.247)and preoperative GCS of <5(p=0.0000)were noted to be most significant.

Table 10:post operative Outcome of CSDH

Variable	Frequency (%)
GOS	
Death	2 (3.1)
Moderate disability	5 (3.1)
Good recovery	58 (89.2)
MW	
Normal	57 (87.7)
Alert & oriented	1 (1.5)
Drowsy or disoriented	5 (3.1)
Comatose with absent motor response to painful stimuli	2 (3.1)

Table 11:multivariate analysis of the post operative outcome

Age VS outcome

Variable	GOS		P value
	Unfavorable	Favorable	
Age			
018-20	0 (0.0)	1 (1.7)	0.178
021-30	1 (14.3)	8 (13.8)	
031-40	0 (0.0)	4 (6.9)	
041-50	1 (14.3)	6 (10.3)	
051-60	0 (0.0)	7 (12.1)	
061-70	2 (28.6)	17 (29.3)	
071-80	2 (28.6)	12 (20.7)	
081-90	1 (14.3)	2 (3.4)	
>090	1 (14.3)	1 (1.7)	
Sex vs outcome			
Sex			
Male	6 (85.7)	53 (91.4)	0.510
Female	1 (14.3)	5 (8.6)	
Risk factors vs outcome			
Alcohol use			
Yes	3 (42.9)	23 (39.7)	1.000
No	4 (57.1)	35 (60.3)	
Anticoagulant use			
Yes	2 (28.6)	7 (12.1)	0.247
No	5 (71.4)	51 (87.9)	
Antiplatelet agent			
Yes	0 (0.0)	4 (6.9)	1.000
No	7 (100.0)	54 (93.1)	
History of head trauma	4 (57.1)	33 (56.9)	1.000
Yes	3 (42.9)	25 (43.1)	
No			
Cormobid vs outcome			
Hypertension			
Yes	2 (28.6)	15 (26.3)	1.000
No	5 (71.4)	42 (73.7)	
Diabetic			
Yes	2 (28.6)	13 (23.2)	0.667
No	5 (71.4)	43 (76.8)	
Renal disease			
Yes	1 (14.3)	17 (30.4)	0.662
No	6 (85.7)	39 (69.6)	

GCS vs outcome			
GCS 13-15 9-12 5-8 <5	 1 (14.3) 2 (28.6) 1 (14.3) 3 (42.9)	 37 (63.8) 14 (24.1) 6 (10.3) 1 (1.7)	0.000
Radiological pattern vs outcome	**GOS**		**P value**
	Unfavourable	**Favourable**	
Thickness 5-10 mm 10-20 mm 20-30 mm >30 mm	 2 (28.6) 4 (57.1) 1 (14.3) 0 (0.0)	 15 (27.8) 30 (55.6) 7 (13.0) 2 (3.7)	1.000
Volume 15-30 mls 30-50 mls 50-100 mls >100 mls	 1 (14.3) 1 (14.3) 2 (28.6) 3 (42.9)	 4 (7.3) 5 (9.1) 19 (34.5) 27 (49.1)	0.616

Variable	**MW**		**P value**
	Unfavourable	**Favourable**	
Thickness 5-10 mm 10-20 mm 20-30 mm >30 mm	 0 (0.0) 1 (100.0) 0 (0.0) 0 (0.0)	 17 (28.3) 33 (55.0) 8 (13.3) 2 (3.3)	1.000
Volume 15-30 mls 30-50 mls 50-100 mls >100 mls	 0 (0.0) 0 (0.0) 0 (0.0) 1 (100.0)	 5 (8.2) 6 (9.8) 21 (34.4) 29 (47.5)	1.000

Outcome based on Hospital stay:

A.By age:

Generally,the length of hospital stay was uniformly balanced across different ages except the very old stayed longest due to unfavorable outcome complicated by respiratory tract infection for those above 90yr(33 days).The disproportionately mean length of stay of 2.3 days for those in 9th decade is because of mortality of one at 89 yr.The other peak of of long hospital stay found in 3rd decade(9.4days) was those who had initial low GCS ,were admitted initially in ICU but made subsequent good recovery.

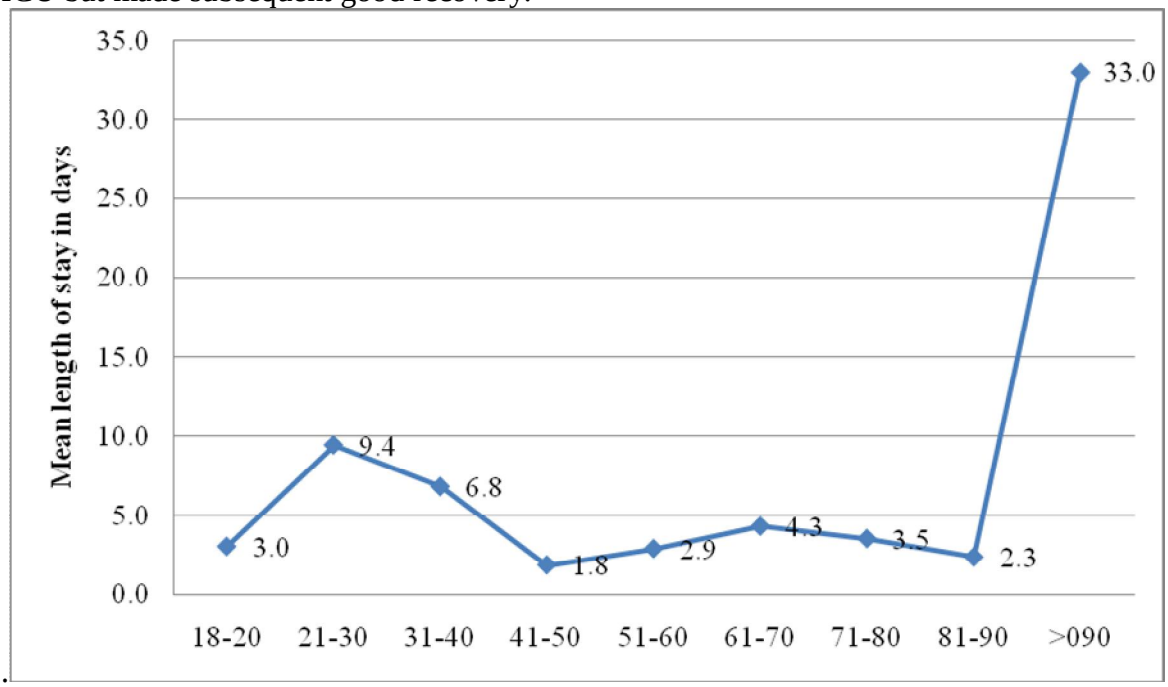


Figure 1: Mean length of stay across age groups

B.By preoperative GCS

Generally patient with good preoperative GCS (13-15) regardless of the radiological finding(such as volume of the subdural collection,midline shift ,thickness of the clot or the radiological pattern)stayed the shortest time in the hospital with an average of 4.2 days .Patient

with low GCS on the other hand regardless of the age stayed longest with GCS of 9-12 staying an average of 6.1 days and GCS of 5-8 an average of 7.4 days. The only exception is the critically ill (GCS of less than 5)who did not live for long despite the intervention.

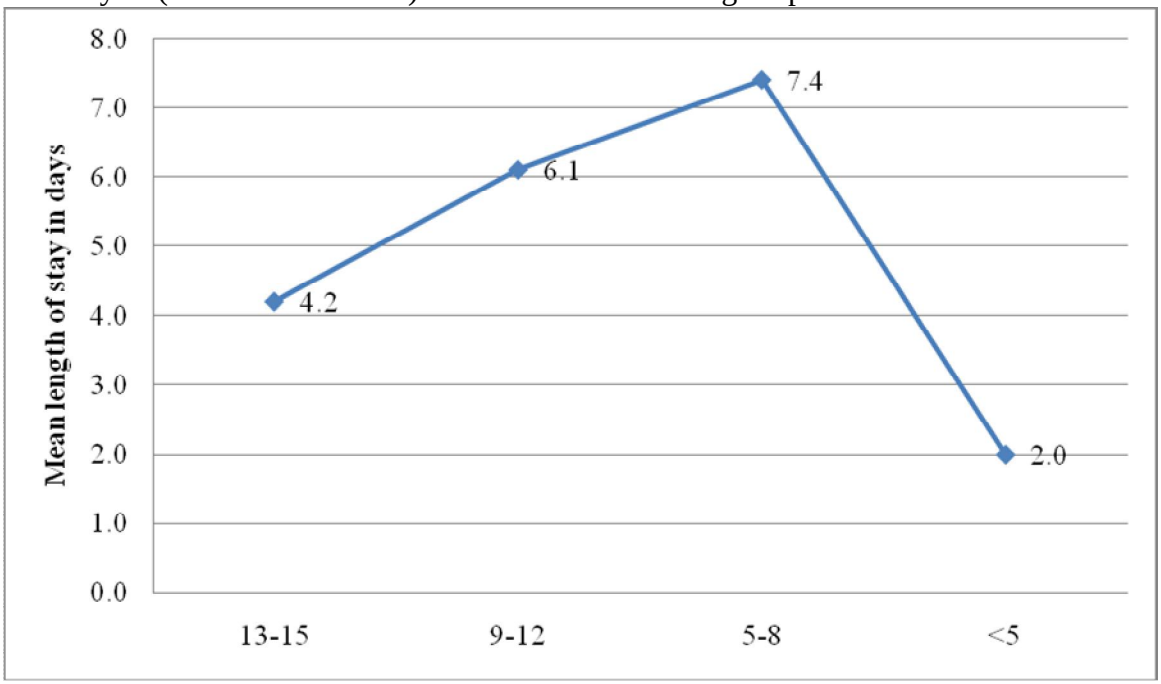


Figure 2: Mean length of stay by GCS

C.By volume of Clot

The volume of CSDH on imaging did not have significant influence on length of stay as compared to GCS or age of the patient.Infact those patient lower GCS and the very old stayed longer despite the relatively low volume of chronic subdural collections due to unfavourable post operative outcome or post operative complication(average 10.4 days).

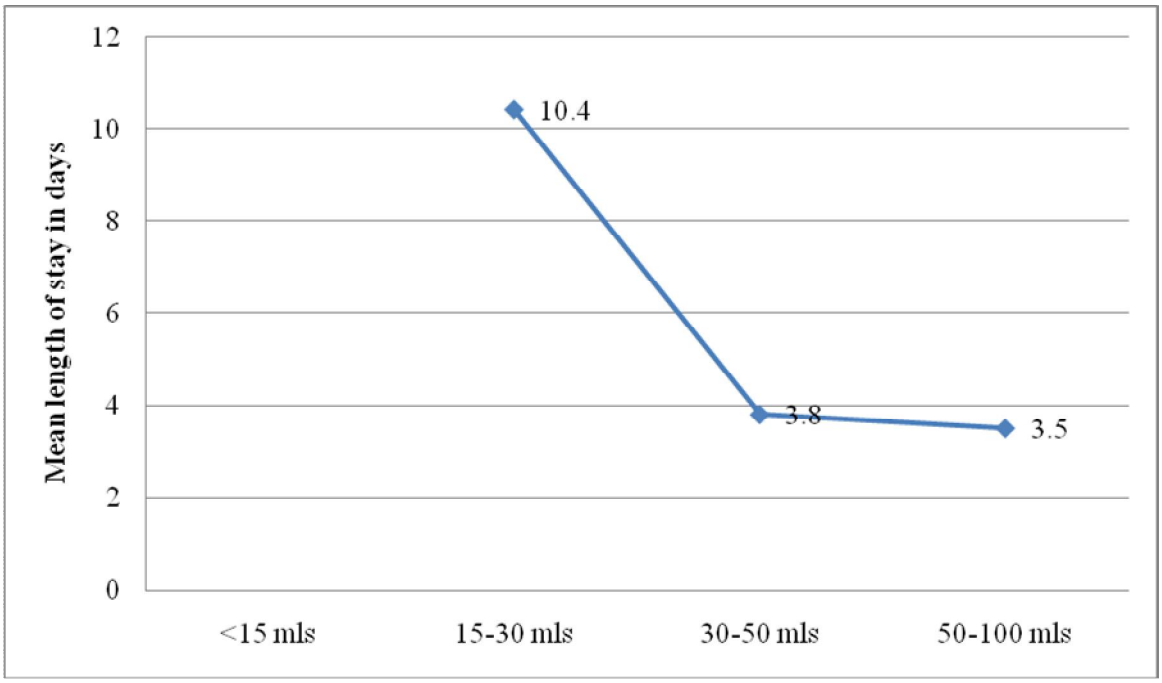


Figure 3: Mean length of stay by volume

CHAPTER FIVE

5.0 DISCUSSION

According to the literature,CSDH tend to afflict the elderly who suffer much larger bleeds due to the associated cerebral atrophy with increasing length of bridging veins[3]. This was confirmed in our study where majority of our patient were between the age of 61-80yrs(47.7%).Because of the lower life expectance in our developing world, this age group represents the elderly in our population. Our study showed dramatic sex predilection. Over 90% of the patient were male.This could be attributed to majority of the alcoholics being male and also more likely to suffer trauma.If this is the main reason or we have other yet to be known factors is the question that need to be answered.It may be ,male sex alone is a major risk factor for developing chronic subdural haematoma since risk factors alone does not explain fully this predilection.

On clinical presentation, main symptoms that our patient presented with was headache(83.1%)and confusion(72.3%)followed by lateralizing signs(paresis)58.5%) and positive history of headtrauma(56.9%).Aphasia(44.6%), loss of consciousness(43.1%) and vomiting come in third and the rarest presentation being convulsions and blurring of vision at 18.5% and 7.7% respectively.Of all the risk factors that have been associated with CSDH,trauma was commonest with 56.9%giving history of recent trauma.In addition 13.8% had a history of previous head trauma(total 70.7%),followed by alcohol at 40% and coagulopathy at 13.8% and then convulsive illness(10.8);use of anti platelet agent(6.5%).The rest of risk factors were found in less than 5% of the patients.It is worth to note that we limited our alcoholic definition to those with alcohol abuse(by WHO definition)and alcohol dependence(DSM IV).This figure will be probably be higher if we included moderate drinkers(daily intake of two units or less of alcohol

per day).We were also limited in quantifying the alcohol units because most of the patient were either confused or used traditional brew which was hard to quantify or we lacked corroborative history from caregivers. We were also hampered by how to classify the occasional heavy drinkers(weekend and end month).This was especially common in 30-60 age group, who were also prone to traumaIn addition the patients who had coagulopathy were also heavy consumers of alcohol.

Trauma which was most important risk factor(70.7%) was mostly minor and remote. The mean duration to onset of symptoms being one month(range was 2 weeks to 6 months).The major causes were falls while drunk, assault and road traffic accident in that order. The history of trauma could even be higher bearing in mind the recall bias as most patient presented with confusion and trauma was remote and often minor especially in elderly.Compared to what is in literature; Lee et al(1998) noted in his series that acute subdural haematoma as a result of major head trauma turned to CSDH in only 3%-6% of cases[12];however, minor head insult has been confirmed by different authors [13,14,15]to be a major predisposing factor. Stroobandt, in his study of 100 patients, found it be as high as 80%, compared to taking aspirin(16%), coagulopathy(6%) and ethylism(11%)[50] .In our study trauma was also the highest at 70.7% followed by alcohol consumption at 40%.Although history of use of anticoagulant and antiplatelet agent was at 13% and 10% in our study,all had fairly acceptable coagulation profile with INR <2.0.Severe coagulopathy was found in 3 patient(4.6%)however,all of them had heavyalcohol Consumption. One INR was >5.0(82yr old male, alcoholic) and the other two 5 and 3.5. These finding compared favourable with literature finding,where the incidence of coagulopathy ranges from 10% to as high as 42% as found by different authors(Grisoli et al (1985)10%[10,15,17,18,16,12,11,14,19],Hardes et al(1981)18%[20],Reymond et al(1992)26%[21] while

Koniq et al(1983) found 42% coagulation disorders in his series of 114 patients of whom 13% were alcoholic, 8% on salicylate with accompanying platelet aggregation abnormality,15% on warfarin and 6% had hematological/oncological diseases[18].INR was found to be the best indicator for coagulopathy in coagulation profile that included complete blood count, liver function tests, prothrombin time,activated partial thromboblastin time(aPTT), platelet count and fibrinogen level. In a multivariate analysis of risk factors in oral anticoagulation related to intracranial haemorrhage carried out by Berwerts and Webster(2000)[22] ,hypertension, INR >4.5 and duration of anticoagulation were found to be significant predisposing factors.

In assessment of pre operative neurological state,it was found that majority of the patients had Glasgow coma scale of 14(30.8%)or 15(24.6%) followed by 10-12(21.5%) and then 6-9(12.3%) with very sick patient of less than 6 making up 6%.Despite the fewer numbers of those with poor preoperative state; they formed the bulk of those with poor outcome (low Glasgow outcome scale) and had the longest hospital stay up to two weeks in contrast to our mode of three days.

The common radiological pattern was subacute subdural (32.3%-normura B/stansic c)followed by chronic (24.6%-normura C/stansic a).However,in terms of complication such as recurrence;it was acute on chronic,the separated type(normura D/stansic f)that carried the day(100%).This is in keeping with finding by Nornura et al[26.] According to Normura et al(1989) and Nakaguchi et al the separated type/layering type are associated with higher recurrence.[26,53] In fact Nomura et al. analyzed the concentrations of fibrinogen, fibrin monomer, and d-dimer in patients with “layering-type” CSDH and reported that the layering type of CSDH is active, has a high tendency to rebleed, and exhibits hyperfibrinolytic activity. This non homogeneity occurs as part of intermittent cyclic process of haemorrhage originating from external membrane

capillaries favored by FDPs or as a consequence of new trauma.[54] This was confirmed by Stansic et al(2005) in relation to post operative recurrence[5] where he subclassfied the acute on chronic into separated density subtype 43.8%,laminar density type(26.7%) making up a total of 70.5% compared to trabercular density type(CSDH with membranes)18.8%) sub acute type(11.8%).

On post operative outcome,we had 89.2% favourable outcome based on one modality of intervention(2 Burr hole craniostomy with irrigation).This compares favourably with the one in literature according to William et al [39] where 16% of those with burrhole without drain detoriated post operatively and 11% required reevacuation compared to 7%with drain in situ who detoriated post operatively and required re evacuation and 64% with Twist drill craniostomy without suction who needed reoperation.The results are even better if you consider length of stay in which, according to Taussky P[45] in his study where he compared two BHC and one burrhole,where average stay was 9days for 2 BHC and 11 days for one BHC or even Okada Y et al ,where he found 14.1 days in drainage group and 25.5 days in irrigation group.For our study it was an average of 4 days.This study reaffirms the efficacy of 2 BHC with irrigation as supported by literature review done by Wigel et al where although there was no article that provided class I evidence, Six articles met criteria for class II evidence and the remainder provided class III evidence. Evaluation of these results showed that twist drill and burr hole craniostomy were safer than craniotomy; and although burr hole craniostomy and craniotomy were the most effective procedures; burr hole craniostomy had the best cure to complication ratio (type C recommendation).Although he concluded that the drain reduced the risk of recurrence in BHC and TDC(type C recommendation)[44] ,the low recurrence rate,coupled with relatively short hospital and good post operative outcome makes burrhole craniostomy without drain the

modality of choice in our set up.Moreover the use of drain being type C recommendation with some authors like Stansic M et al(2005) who concluded that the neither the use of drain,duration of drain nor volume of drain had significant influence on recurrence rate[27] .

For post operative Complication ,Two patients (3.1%)had recurrence of which one was an empyema. The same patient had initial INR of >5 and was alcoholic. The microscopy and culture grew citrobactor sensitive to meropenem.Both patient had acute on chronic subdural haematoma, the graded type(Normura D/stansic f) and recovered fully after repeat burrhole.Mortality occurred in two of our patient (3.1%).Both had a Glasgow coma scale of less than 5.One was65yrs male and the other 92yrs female.The 65 yr old had a lower respiratory tract infection in addition. Of the three patient who developed seizures, one was 83yrs old male with hyponatremia(serum sodium of 116) and preoperative GCS of 6 and the other 67yr old ,hypertensive with frontal infarct in addition. The third patient was a known alcoholic with preoperative GCS of 4.All the three had a longer hospital stay of over two weeks compared to the mean of three days found in our studyIn terms of post operative outcome favorable outcome was seen in majority of the patient(89.2%).In multivariate analysis of factors predisposing to poor outcome, old age($p= 0.178$),coagulopathy($p=0.247$)and preoperative GCS of <5($p=0.0000$)were noted to be most significant. It is interesting to note that neither the midline shift nor the volume of bleed had any significance to the post operative outcome.

6.1 CONCLUSION

The major risk factors for CSDH in our setup is male sex,trauma,old age and alcohol intake. Low preoperative Glasgow coma scale,coagulopathy and old age were major determinants of poor outcome. Acute on chronic subdural haematoma and coagulopathy is associated with recurrence.Burrhole craniostomy without drainage has good outcome in our set up and should be initial modality of choice based on our relatively short hospital stay,low recurrence rate and few patient with coagulopathy.Use of Drains should be preserved to those with propensity to recur,that is the coagulopathic patient and with acute on chronic subdural haematoma.

RECOMMENDATIONS

1.Develop and standardize a clinical risk assessment form that will be used by every clinician in neurosurgery to document history, capture relevant clinical and radiological patterns and complications that will form a series.

2.Further research should be done on why the high incidence of CSDH among the male population.

3..Implement public education on the adverse consequences of alcohol consumption in relation to the development of Chronic subdural haematoma based on these findings and supported by previously published and current research.

4.Formulate elaborate public health policies aimed at reducing the prevalence alcohol consumption across the country.

5.Encourage evidence based study based on this finding and the other finding that will follow.For example,there is need to have very low threshold for CT scan in any elderly patient or alcoholic presenting with headache or confusion even if there is no history of trauma.

6.From prognostic indicators we found leading to adverse outcome, this should form the basis of preoperative counseling/ giving consent and mode of management

7.Since the primary intervention was 2 burr hole craniostomy with irrigation but without drain,a case control study should follow to elucidate actual advantage of the drain.

8.For patients complicating with seizures,every effort should be made to find out other causes of it before attributing it to haematoma. Prophylactic anticonvulsants should also not be routinely be given in patient with chronic subdural haematoma.

8.Since coagulopathy was both a causative agent and a factor in outcome,every effort should be made to have coagulation profile in patients presenting with CSDH

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APPENDICES

APPENDIX 1:

QUESTIONNAIRE

STUDY NUMBER……HOSPITAL NUMBER…WARD……DOA…DOD……DOS….

AGE (years)…… 18-20,21-30,31-,40,41-50,51-60,61-70,71-80,81-90,>90
.
SEX…… MALE…….. FEMALE……

PRESENTING COMPLAINTS

HEADACHE
NAUSEA/VOMITING
CONVULSIONS
LOSS OF CONSCIOUSNESS HOW LONG
BLURRING OF VISION
PARESIS MONO RIGHT LEFT
HEMI
QUADRI

INABILITY TO TALK

CONFUSION
ANY OTHER(SPECIFY) …….

HISTORY OF HEAD TRAUMA Y ( ) N ( ) IF YES,HOW LONG AGO ( )
PAST MEDICAL HISTORY

CONVULSIVE ILLNESS? Y ( ) N ( ) IF YES,WELL CONTROLLED? ( )

CEREBRAL PALSY

HISTORY OF CVA

PREVIOUS HISTORY OF TRAUMA TO THE HEAD?IF YES,HOW LONG? ( )

PREVIOUS HEAD SURGERY

PREVIOUS HEAD INJURY WITH RESIDUAL DEFICITS

( ) ( ) ( )

ALCOHOL USE? Y N IF YES;UNITS/WEEK

ANTICOAGULANT USE?Y ( ) N ( ) IF YES;INR ( )

ANTIPLATELET AGENT(ASPRIN,NSAIDS)?Y ( ) N ( ) BLEEDING TIME ( )

VPS SHUNTING/LUMBAR PUNCTURE

OTHER CORMOBIDS
HYPERTENSIVE,IF YES:WELL CONTROLLED?Y ( ) N ( ) B.P ( )

DIABETIC?IF YES ,WELL CONTROLLED?Y ( ) N ( ) RBS ( )

RENAL DISEASE ?IF YES,DIALYSIS?Y ( ) N ( ) UREA ( ) CR ( )

<u>GENERAL EXAMINATION (TICK WHERE APPLICABLE)</u>

GOOD GENERAL CONDITION…….
SICK LOOKING……
UNCONSCIOUS……..
OTHERS(specify)……..
SIGN OF RECENT HEAD TRAUMA(specify)……

VITAL SIGNS AT ADMISSION

BP……TEMP……RR……PR……

<u>NEUROLOGICAL EXAMINATION</u>

GCS/PGCS ON ADMISSION

MOTOR VERBAL EYE TOTAL

<u>PUPILLARY REACTION</u>

TO LIGHT BRISK SLUGGISH NO CHANGE
PINPOINT DILATED

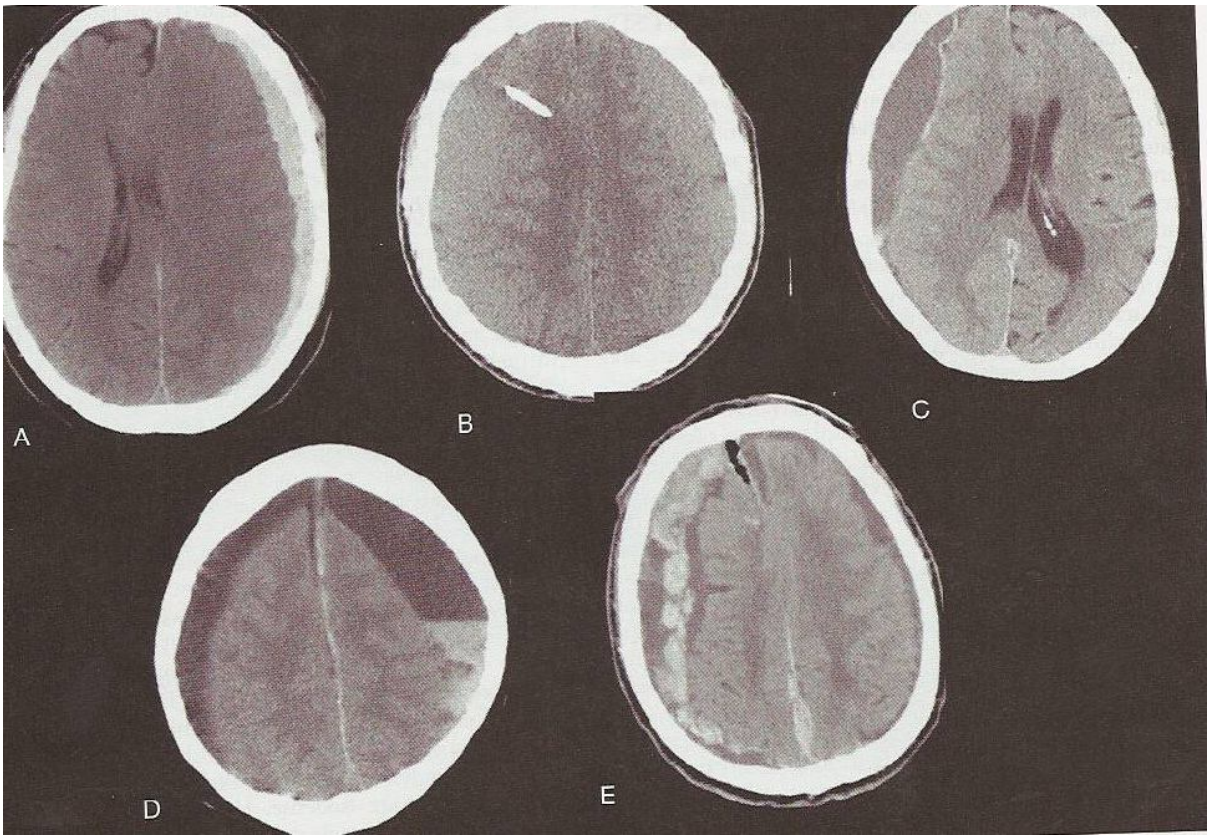
RIGHT
LEFT

CT SCAN FINDINGS (TICK WHERE APPLICABLE)
NORMURA CLASS(1-5)…….STANSIC CLASS(a-h)…….MLS……
THICKNESS…….VOLUME…….UNILATERAL…..BIL……

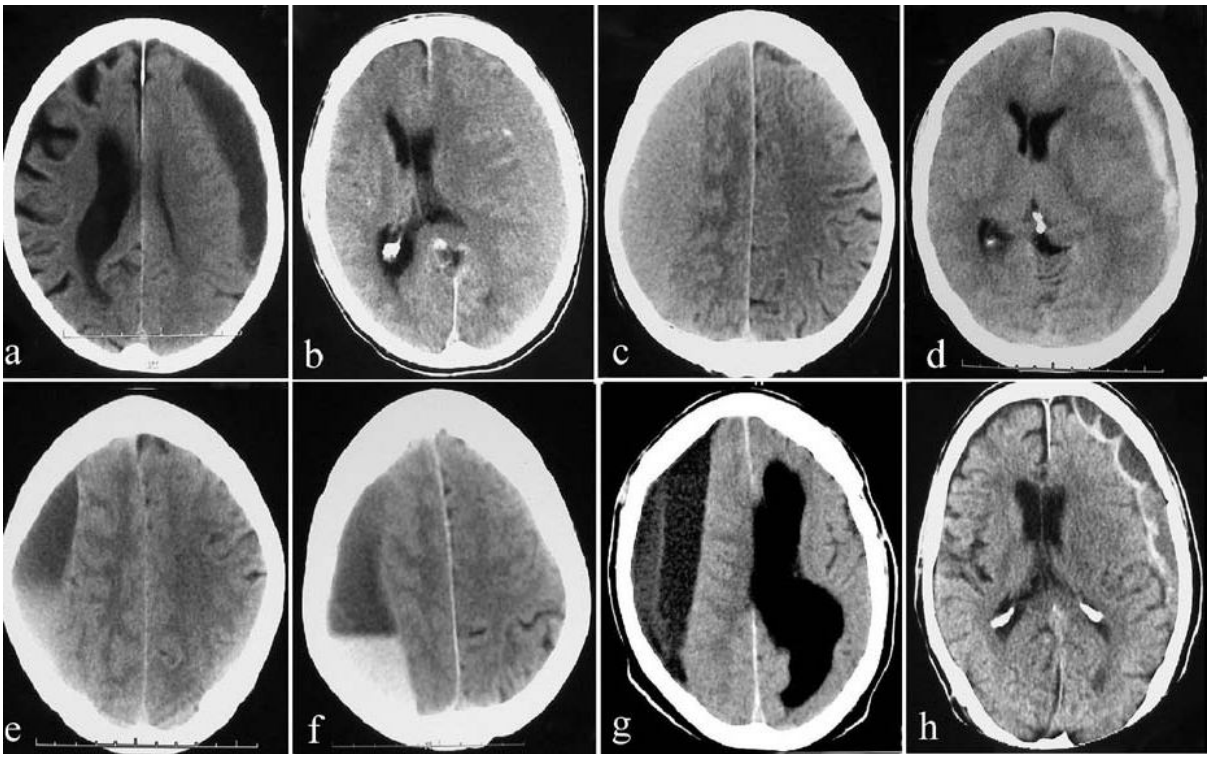
GLASGOW OUTCOME SCALE (ON DISCHARGE FROM HOSPITAL)
(TICK WHERE APPROPRIATE)

grade	**description**
1	DEATH
2	PERSISTENT VEGETATIVE STATE
3	SEVERE DISABILITY (conscious but disabled) Also includes Severe mental disability
4	• MODERATE DISABILITY (disabled but independent • . Dysphasia • hemi paresis • ataxia • memory deficits, • personality changes • intellectual deficits.
5	GOOD RECOVERY This is resumption to normal life even though there may be minor neuropsychological deficits

Mark Walder grading scale	Description
0	normal
1	Alert&oriented.Abscence of mild symptoms such as headache or mild neurological deficit such as reflex asymmetry
2	Drowsy or disoriented or variable neurological deficit such as hemiparesis
3	Stuperous responding appropriately to noxious stimuli;several focal signs such as hemiplegia
4	Comatose with absent motor response to painful stimuli,posturing



NORMURA



STANSIC(a-h)

APPENDIX II

NEXT OF KIN'S CONSENT FORM FOR STUDY

STUDY NUMBER…….. . HOSPITAL NUMBER……..

TITLE OF THE STUDY:
CHRONIC SUBDUAL HAEMATOMA: PRESENTATION, RISK FACTORS AND POST OPERATIVE OUTCOME AS SEEN IN KENYATTA NATIONAL HOSPITAL
INVESTIGATOR

Dr.Godfrey Barasa Wasike
Introduction

I am requesting you to voluntarily participate in a research study. The purpose of this consent form is to give you information you will need to help decide whether to participate in this study or not. You are free to ask any questions about the study or this form that you are not clear about. When all your questions have been answered, you can then decide whether to participate in the study or not.
Purpose of the study

The purpose of this study is to find out how age, clinical presentation including Glasgow Coma Scale/preoperative neurological status(a grade to determine how sick your patient is before surgery) underlying risk factors and abnormal CT scan findings(please refer to the CT scan pictures on your questionnaire), influence the short term post operative outcome based on Glasgow Outcome Scale/markwalder scale(a measure on how well the patient will be within a month after the operation)for chronic subdural hematoma(ie persistent accumulation of blood below the outer coverings of the brain) and if the findings differ across different age groups. Similar studies have been done before elsewhere in the world and they are important because they give new information to the clinicians of what to emphasize on when reviewing a patient with chronic subdural hematoma as well as set a platform for future studies all aimed in giving evidence based care to our patients.
Procedure

After you have accepted to participate in the study and signed this consent form, I will ask you questions to confirm, or clarify where necessary information in the patient's file regarding history of the patient. I may do a physical and neurological examination and read the CT scan after which with the permission of your primary doctor we will explain to you about my findings and possible mode of intervention.
Benefits of participating in the study

All questions regarding the condition of the patient will be fully explained

Will assist in adding to already existing information about this condition

Risks of participating in the study

There are no risks anticipated for those who will participate in the study
Your participation in this study is voluntary.
You are free to decline consent and will not be victimized in any way or denied services for declining to be interviewed. Participation in the study does not entail financial benefits.
You can pull out of the study any time during the study period.

Confidentiality

All the information obtained will be held in the strictest confidence.
The questionnaires and consent forms shall be kept in lockable cabinets in the department of surgery and password enabled computers accessible only to me and the data manager.

Cost and payment

I understand that participation is volunteering and that I will meet all the hospital and theatre expenses.

Ethical consideration

This study has been reviewed and approved by the Ethical Review of Kenyatta National Hospital. It fulfills all conditions set.
Do you have any questions?
Do you agree?

NEXT OF KIN

The study described above has been explained to me. I have had a chance to ask questions. I am aware that participating in this study is voluntary and my declining will not result in victimization whatsoever.
Having understood the above:

I agree to be interviewed and examination done on the patient…..
I decline to be interviewed and examination done on the patient….

Signature…….or Thumb print……
Date……
Signature of investigator……
Name of investigator……..

WITHDRAWAL PRIVILEDGE

I understand that I will be free to withdraw from the study at any stage.

Useful contacts: 1) KNH/UON/ERC. Telephone: 020726300 ext: 44102

Email:uonknh_erc@uonbi.ac.ke,P.O Box 20723code 00202

CONSENT BY THE PATIENT

I……..of…… hereby give consent to be included in this study. The nature of the study has been explained to be by Dr……
He has NEITHER coerced me NOR has he forced me to be part of this study. I understand that there will be NO monetary gain in return.

Date…….Signed……..

I Dr…… confirm that I have explained to the patient the nature of the study.

Date…… Signed…….

KIBALI CHA MFADHILI

NAMBARI YA UCHUNGUZI…….. . NAMBARI YA HOSPITLALI……..

:

UVUJAJI WA DAMU CHINI YA KIFUNIKA UBONGO(DURA) :PATANI YA MARADHI, VISABABISHI NA MATOKEO BAADA YA UPASUAJI JINSI YALIVYO KWENYE HOSPITALI KUU YA KITAIFA,KENYATTA

MTAFITI MKUU

Daktari.Godfrey Barasa Wasike

Kitokezi

Nakuomba kwa hisani yako ujumulike kwenye huu utafiti. Lengo kuu haswa la kibali hiki ni kukupa maelezo kamili itakayokuwezesha kufanya uamuzi maridhawa wa kuendelea na huu uchunguzi au la.Umeruhusiwa kuuliza swali au maswali yoyote kuhuzu huu uchunguzi au kibali hiki kabla ya kuamua kama utaendelea na huu uchunguzi au la.

Malengo ya huu utafiti

Lengo kubwa haswa la huu uchunguzi ni kubainisha kama umri,matokezi ya maradhi kama vile kipimo cha fahamu cha glascow/hali ya mgonjwa kabla ya upasuaji,visababishi vya ugonjwa na hitilafu zinazopatikana kwa picha za CT scan(Ekisirey maalumu iliyokarabatiwa na komputa)zinavyobatilisha matokeo ya mgonjwa baada ya upasuaji kutumia kipimo maalum cha ‘Glasgow Outcome Scale’ na ‘markwalder outcome scale’.

Uchunguzi Kama huu umefanywa kingwineko ulimwenguni na ni wa umuhimu kwa minajili ya kuangazia madaktari ni mambo gani haswa yanafaa yatiliwe maanani na madaktari/wahudumu wanapowahudumia wagonjwa wenye haya maradhi.Vilevile, itakuwa msingi bora utakaotumika kwenye chunguzi zingine za baadaye zitakazonuia na kukariri huduma bora kwa wagonjwa wetu..

Jinsi itakavyofanywa

Baada ya kukubali kujumulika kwa huu utafiti kwa kuweka sahihi kwa hii kibali,Nitakuuliza maswali kadha kuhakikisha au kubainisha ,ujumbe uliyomo failini ya mgonjwa kuhusu historia ya maradhi haya.Nitampima mgonjwa na tena nichunguze yeye kiakili halafu niichambue Ekisirei spesheli iliyokarabatiwa na komputa(CT scan)kabla ya kukueleza wewe mhifadhi/mgonwa maradhi anayo/unayo na vile tutakavyo yatatua.

Umuhimu wa huu utafiti

Maswali au tashwishi yoyote kuhuzu mgonjwa utaelezwa kikamilifu.
Tutaongezea maarifa yaliyoko kuhuzu ugonjwa huu wa uvujaji wa damu chini ya kifunika ubongo.

Hatari za kushiriki kwenye huu utafiti

Hakuma hatari yoyote kwa wale wote watakaoshirrki
Kushiriki kwa huu utafiti ni wazi na si wa kulasimisha.
Uko huru kukataa kibali na hutashurutishwa au kunyanyazwa kwa njia yeyote ile.
Hakuna marupurupu yatakayopewa kwa Kushiriki kwenye huu utafiti.
Unaweza jitoa kwenye huu utafiti wakati wowote ule .

Faragha

Maelezo/uchunguzi wote utawekwa kwa faragha kubwa/uaminifu.
Fomu ya maswali na kibali yatafungiwa kwa kabati ya kifuli kule kwa idara ya upasuaji na matokeo kwa komputa iliyo na neno la faragha la kuifungua .

malipo

Naelewa kuwa ushiriki ni wa kauli yangu mwenyewe na nitatimiza gharama ya hospitali na upasuaji.

Hujuma za kibinadamu

Huu utafiti umegakuliwa na kupitishwa na idara ya hujuma za kibinadamu ya hospitali kuu ya kitaifa,Kenyatta. Imetimizamatakwa yote iliyowekwa.
Uko na swali lolote?
Unakubali?

MFADHILI

Nimeelezewa huu utafiti.Nimekuwa na fursa ya kuuliza maswali.Naelewa kuwa kushiriki kwangu ni kauli yangu mwenyewe,na iwapo nitakataa zitadhulumiwa kwa njia yoyote kamwe.

Baada ya kuelewa hayo yote,

Nakubali kuulizwa maswali kuhuzu mgonjwa wangu na kuruhusu apimwe vile inatakikana.
Sahihi…….au Alama ya kidole gumba……

Tarehe……
Nakataa kushiri kwa huu utafiti
Sahihi…….au Alama ya kidole gumba……
Tarehe……
Sahihi ya mtafiti……
Jina la mtafiti……..

Uhuru wa kujitoa

Naelewa kuwa niko na uhuru wa kujitoa kwa utafiti wakati wowote.

Anwani muhimu: (1) KNH/UON/ERC. Telephone: 020726300 ext: 44102

Email:uonknh_erc@uonbi.ac.ke,P.O Box 20723code 00202

2) Prof. J. N. Mwang'ombe. Telephone: 0722788994

Kibali cha mgonjwa

Mimi……..kutoka…… napeana kibali cha kushiriki kwenye huu utafiti.Nime elezwa chanzo na umuhimu wa huu utafiti na daktari……

Hajanilazimisha au kunishawishi kushiriki kwenye huu utafiti . Naelewa kuwa hakutakuwa na marupurupu ya kulipwa kwa kushiriki.

Tarehe…….Sahihi……..

Mimi, Daktari…… nahakikisha kuwa nimemuelezea mgonjwa chanzo na maana ya huu utafiti.

Tarehe…… Sahihi…….

APPENDIX III

GLASGOW COMA SCALE

Score	EYE	VERBAL	MOTOR
6			Follows command
5		Oriented and able to converse	Localizes to pain
4	Opens eyes spontaneously	Disoriented and able to converse	Appropriate withdrawal to painful stimuli
3	Opens eyes to a verbal command	Uses inappropriate words	Abnormal flexion to painful stimuli
2	Opens eyes in response to pain	Makes incomprehensible sounds	Abnormal extension to painful stimuli
1	No response	No response	No response

2.6 VARIABLES

Dependent Variable

Post operative outcome of the patient included the Glasgow outcome scale and Markwalder prognostic indicator for CSDH. The main outcome was measured by the Glasgow outcome scale (GOS) 48hours hours post operatively, two weeks and then one month. For ease of analysis and reporting, the five-point GOS score was categorized as either favorable (4, 5) or unfavorable (1, 2, 3)

Whereby:

1. DEATH

2. PERSISTENT VEGETATIVE STATE

3. SEVERE DISABILITY (conscious but disabled)

4. MODERATE DISABILITY (disabled but independent)

This included:Dysphasia,hemi paresis,ataxia,memory deficits, personality changes and

5. GOOD RECOVERY

This is resumption to normal life even though there were minor neuropsychological deficits.

Other specific complication post operatively included

- New or recurrence bleed
- Infection that is subdural empyema
- Seizures
- Tension pneumocephalus

Independent Variables

- Age: We limited our study to adults only (above 18 years) just like our comparison studies. Also pericerebral effusions in infancy constitute quite a different pathology[48]
- Sex
- coagulopathy
- Alcohol use
- Risk of frequent falls i.e. convulsive disorder or hemi paretic patient
- History of recent head trauma
- Post ventricular peritoneal shunt/lumbar puncture. It shall be excluded as it entails a different entity altogether as a cause of chronic subdural haematoma.
- Radiological pattern of the CSDH
- Cerebral atrophy e.g. from dementia or other degenerative neurological diseases
- Other Co morbidities included diabetes, hypertension, COPD, known malignant disease and renal disease