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Surgical Treatment of Chronic Subdural Hematoma by Single  
BurrHole under Local Anesthesia: Outcome of a Prospective Study



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## **Surgical Treatment of Chronic Subdural Hematoma by Single Burr Hole under Local Anesthesia: Outcome of a Prospective Study**



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### **Abstract**

**Purpose:** Surgery is the usual treatment of chronic subdural hematoma: the most commonly used procedure is double burr hole craniostomy under general anesthesia for evacuation of the hematoma. However, there is an alternative technique which is single burr hole under local anesthesia. The purpose behind this study is evaluation of the prognosis of this technique in the management of CSDH according to the cause, clinical presentation, surgical procedure, and outcome.

**Methodology:** In this prospective study, 41 patients with CSDH underwent single burr hole craniostomy under local anesthesia from June, 2022 to May, 2023, at West Erbil Emergency Hospital based on the etiology, clinical picture, surgical procedure, and complications. We excluded some cases from our study: age less than 20 years, uncooperative patients, and multilocular hematomas.

**Findings:** Patients were from 20 to 85 years of age and the mean age was 65 years. Among them, 24 (58.5%) were males and 17 (41.4%) were females. Previous trauma was the major cause of CSDH in 27 (65.8%) followed by coagulopathy in 7 (17%), anticoagulant or antiplatelet drugs in 5 (12%) and ICP hypotension in 2 (4%). Contralateral weakness was the most common presentation in 23 (56%), headache in 16 (39%) disturbance in level of consciousness in 10 (24.3%), and convulsion in 6 (14%).

**Unique Contribution to Theory, Policy and Practice:** Single burr hole craniostomy under local anesthesia is effective, safe, and sufficient way in the management of cooperative patients with unilocular CSDH. This technique resulted in short hospital stay, low cost, and fewer complication rate.

**Keywords:** *Chronic subdural hematoma, Burr hole, Local anesthesia, Outcome*

## **Introduction:**

Chronic subdural hematoma is defined as accumulation of blood or blood breakdown products which is completely or partially liquefied and is located between the dura and the arachnoid matter present at least for 21 days (1). It constitutes 1.5 to 3 cases per 100,000 population annually (2).

Elderly people, due to brain atrophy and resultant large subdural space, are more susceptible to develop CSDH (4). Apart from that, Old people have these predisposing factors: ataxia, cerebral atrophy, motor deficit, and increasing capillary fragility (5). The coexistence of systemic diseases in this age makes general anesthesia more problematic compared to young people (6).

Its manifestations are different from patient to patient (3). Ranging from asymptomatic to unconsciousness. Brain CT scan is the gold standard diagnostic investigation in which CSDH usually appears as crescent-shaped hypo-dense with concave surface toward the brain. MRI, not performed in most patients, is beneficial in detecting bilateral is-dense hematomas and doubtful cases (2,7).

If there is small amount of blood with no mass effects the treatment of CSDH can be conservative. However, usual management is surgery which can be one of these techniques: burr hole craniostomy (the most commonly used procedure), twist drill craniostomy, and craniotomy (8). The last two procedures have high rates of recurrence and higher morbidity and mortality (9). The purpose of this study is to evaluate the outcome of single burr hole under local anesthesia according to clinical features, surgical procedure, and prognosis.

## **Methods:**

We studied in this prospective study 41 patients who had CSDH and operated by single burr hole craniostomy under local anesthesia from June, 2022 to May, 2023 at West Erbil Emergency Hospital according to the manifestations, cause, systemic disease and risk factors, and complications.

The data about signs and symptoms, causes, comorbidities, diagnosis, therapies, and outcomes were collected in a retrospective manner by revising the clinical records,

In this study, patients who were below 20 years, patients whose CT scan showed multilocular hematomas, and uncooperative patients were excluded.

CT scan was the diagnostic modality in all the cases: they were classified into hypodense, mixed density and isedense or slightly hyperdense hematomas,

After obtaining informed consents from patients or their relatives, all of them underwent burr hole craniostomy under local anesthesia.

10 ml Lidocaine HCL 2% (local anesthetic) was used in all cases which was injected subcutaneously and subperiosteally: in some irritable patients sedation with protocol or midazolam

was used. Scalp incision was 3cm down to the periosteum which was then cut by diathermy and the skull was exposed. A 1.5 cm diameter single burr hole was done, then the dura was cauterized and durotomy was done by no.11 scalpel and circular dural flap was performed. The subdural space was irrigated with warm saline until clear fluid comes. A no. 12 Nelaton catheter drain was connected to a closed bag but not under tension for 48 hours. After hemostasis of the scalp edges the wound was closed. The patient was directly transferred to the ward in a flat position with IV fluids, and oral intake was allowed directly. The patients were followed up radiologically and clinically for 6 months.

Glascow coma scale was used but since Mark alder grading scale is more specific in CSDH that scale was used to classify the patients based on neurological status on admission and at discharge (14): grade 0: no deficit, grade 1: oriented and alert, mild symptoms in the form of headache, absent or mild deficit such as asymmetrical reflex, grade 2: disoriented or drowsy with variable deficits such as hemiparesis, grade 3: stuporous but with appropriate response to noxious stimuli, severe deficits such as hemiplegia, and grade 4: comatose with no response to painful stimuli and decorticate or decerebrate posture .

Patients who have no or mild symptoms are considered to have good outcome (15) while who worsened or were unchanged are considered to have poor outcome (16).

### Results:

The patients were between 20 to 85 years in age with 60 years being the mean age. Males were 24 (58.5%) and 17 (41.4%) were women (Table 1). Old trauma was the main cause in 27 (65.8%) followed by liver disorder in 7 (17%), blood thinners in 5 (12%) and ICP hypotension after VP shunt or lumbar puncture in 2 (4%).

Among Clinical manifestations, hemiparesis was present in 23 (56%), headache in 16 (39%), disturbance in level of consciousness in 10 (24.3%), and convulsion in 6 (14%).

Brain CT scan showed hypodense hematomas in 24 patients (58.5%) , isodense to brain tissue in 3 (0.07%), hyperdense in 5 (12%), and mixed density in 9 (21%). The hematoma was in the right side in 17 (42%) and in the left side in 19 (46%) and in 5 (12%) it was bilateral CSDH (Table 2). Follow up CT scan revealed resolution of the hematoma in all the cases with little residual in the early postoperative period and the hematoma was resolved completely at late follow up except 2 cases with recurrent hematoma at 5 and 7 weeks respectively and one patient developed empyema, all of them underwent re-operation by re-exploring the same burr hole with favorable results. One patient developed moderate pneumocephalus and was treated conservatively.

Neurologically, Using Markwalder grading for CSDH, all patients were examined on admission which was 2 (4.8%) in grade 0, 13 (31.7%) in grade 1, 14 (34%) in grade 2, 10 (24%) in grade 3, and 2 (4.8%) in grade 4. The mean grade was 2.

Post operatively, the Markwalder score improved in a dramatic way of which 31 (75%) patients in grade 0, 7 (17%) in grade 1, 1 (9%) in grade 2, 1 (9%) in grade 3, and 1 (9%) in grade 4. Grade 0 was the mean grade (Table 3).

After the surgery, hematoma re-accumulated in 2 patients, one patient had tension pneumocephalus, one case developed empyema, and one case died from severe pneumonia 3 weeks post-operatively. Of patients (95.12%) had good outcome and (4.88%) of patients had poor outcome and death (one died after 3 weeks).

### Discussion:

Table 1 Demographic of the patients

Demographic Data	Percentage	Number
Gender: Male	58.5%	24
Female	41.4%	17
Age	20-85	

Chronic subdural hematoma is regarded as a common neurosurgical condition in old people, and since most of the patients are fragile old people, usually the technique with less invasiveness is preferred. Burr hole evacuation is the gold standard treatment of CSDH (9, 14, 17).

Our goal is lowering and minimizing surgical manipulations and anesthetic drugs and to make recovery with fewer complications and decreased recurrence rate.

Generally, local anesthesia is a more useful method during CSDH surgery in patients who have complicated medical co-morbidities (18, 19).

In addition to that, general anesthesia may make evaluation and assessment early after surgery more difficult to exclude the indication to re-operate due to early collection post-operatively (6).

Local anesthesia has been used in multilocular hematomas and removal of clotted blood endoscopically in fragile people (22). This was used by Lee et al. (21), Yadav et al. (2), and Khadhka et al. (23).

In our study, the mean age was 65 years old, and because of known pathologic changes that occur in this age group, this has been explained in most studies (2).

This study revealed that most of patients were males 58.5% , in a study by Mori and Maeda males were 71% (16), and in Ernestus et al 66% of patients were male (15). Male were predominant because they are more vulnerable for trauma.

Regarding the site of hematoma, in our study and most other studies the most commonly affected site was the left side, Mori and Maeda showed left side hematoma in 52% of cases (16). The left side of the skull is more convex in the majority of people, this explanation may be behind this (24).

A period of days to weeks is required to develop Signs and symptoms. Sometimes, patients deny or are unable to recall head injury. The common predisposing factors include injury to head, seizure disorders, alcoholism, antiplatelet and anticoagulation, and impaired surgical hemostasis. A minor head injury was present in of our cases (2).

Table 2 Clinical and Radiological presentation

		Percent.	Number
Clinical	Hemiparesis	56%	23
	Headache	39%	16
	Convulsion	6%	14%
	Decreased conscious	10	24.3
Cause	Trauma	65.8%	27
	Coagulopa.	17%	7
	Antiplatelet	12%	5
	ICP hypot.	4%	2
CT	Hypo	58.5%	24
	ISO	7%	3
	Hyper	12%	5
	Mixed	21%	9
Sidedness	Right	42%	17
	Left	46%	19
	Bilateral	12%	5

Patients may present clinically with headache, nausea, vomiting, motor or sensory deficit, gait ataxia, speech deficit, symptoms of TIA, seizures, decreased conscious level, and elevated intra cranial pressure. Clinical manifestations in this study were hemiparesis (the most common), headache (at younger ages), disturbance in level of consciousness, and convulsion in few cases. Headache in young people may be explained by elevated intra cranial pressure in this age (16).

The surgical procedures for evacuation of CSDH vary from twist drill craniostomy to large craniotomy techniques (15, 20). We chose single burr hole instead of double burr hole since we assumed that unilocular hematoma can be drained efficiently and irrigated without the need of another burr hole as long as it is a single cavity that contain fluid.

In this study, the mean operative time was 35 minutes which is equal to that of Gozel et al. in time (6) and this is another advantage of our procedure.

Recurrence rate was very low, only two patients 4.8%, and this can be considered as one of the best results which has been reported in CSDH surgery: after burr hole evacuation and irrigation the recurrence rate varies between 2.7 and 34% (14, 16, 23, 25, 26).

Table 3 Markwalder grading of patients with CSDH before and after surgery

Markwalder grade	Preop. No.	Percen.	Postop. No. (early)	Percen.	Postop. No. (late)	Percen.
Grade 0	2	4.8%	31	75%	33	82.5%
Grade 1	13	31.7%	7	17%	6	15%
Grade 2	14	34%	1	9%	1	2.5%
Grade 3	10	24%	1	9%	0	00
Grade 4	2	4.8%	1	9%	0	00
Total	41		41		40	

Recurrence rate is related to poor re-expansion of the brain and the amount of subarachnoid air. Therefore, it is crucial to prevent air influx into the subdural space during surgery (16). Tension pneumocephalus can be prevented by filling normal saline in the subdural space, by this we think that the lower recurrence rate and the absence of tension pneumocephalus were due to capability to fill the subdural space with saline with single burr hole than with double burr holes as there will be no leak from the second burr hole during filling from the first burr hole.

The rate of formation of acute SDH was zero: this was due to the small single scalp incision and the ability to easily control scalp bleeding.

By following and assessing the patients for 6 months, the surgical complications were very few: two recurrent cases and one died because of pneumonia after 3 weeks.

Two patients developed seizures after the surgery, and one of them had seizures before the surgery, the second one developed first seizure post-operatively 1 week after the surgery and was controlled by anti-convulsants within 1 week.

Convulsion is thought to be present rarely, however as an initial symptom it has been reported in about 6% of cases (27).

### **Conclusion:**

Treatment of cooperative patients with unilocular chronic subdural hematoma by single burr hole under local anesthesia is effective, safe, and sufficient and results in low cost, short hospital stay, and lower complication rate.

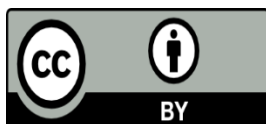
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