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Burr-hole craniostomy versus mini-craniotomy in the treatment of chronic subdural hematomas. Analysis of clinical results

André Tokpa[1], Moussa Diallo[2], Louis Kéabléon Derou[1], Yves Soress Dongo[1], Bernard Fionko[1], Adéréhime Haïdara[1]

[1] Neurosurgery Department of the Teaching Hospital of Bouaké, CÔTE D'IVOIRE
[2] Neurosurgery Department of the Teaching Hospital Grabriel Touré, Bamako, MALI

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Corresponding author:
André Tokpa

Neurosurgery Department of the Teaching Hospital of Bouaké, Côte d'Ivoire

valentin_tokpa@yahoo.fr

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ABSTRACT

Although cases of spontaneous recovery or under medical treatment have been reported, the treatment of chronic subdural hematoma is mainly surgical. The optimal surgical technique for the treatment of chronic subdural hematomas is still open to debate. The purpose of this study was to compare the clinical outcomes between burr-hole craniostomy and craniotomy in patients with chronic subdural hematoma. Materials and methods: we have performed a retrospective study in patients operated for chronic subdural hematoma in the neurosurgery department of the teaching hospital of Bouaké between July 1, 2016, and June 30, 2020. We compared the data of patients operated by a single burr-hole craniostomy (group A) and those operated by minicraniotomy (group B). Demographic parameters, clinical signs, complications and neurological findings were analyzed. Fisher's exact test, Chi-squared, and student's t-test were performed. Results: group A included 46 patients and group B 55 patients. There was no significant difference between the two groups about age (59.5 years vs 59.8 years $p = 0.89$), sex (man: 74% vs 78.2%, $P = 0.645$), comorbidities, clinical signs on admission and location of the hematoma. There was also no significant difference between recurrence rates (4.3% vs 3.6% $p = 0.55$), postoperative complications (15.21% vs 7.27% $p = 0.172$) and neurological findings between the two groups. Conclusion: patient outcomes are similar in the treatment of chronic subdural hematomas by craniostomy and minicraniotomy.

INTRODUCTION

Chronic subdural hematoma (CSDH) is a collection of aged blood that lies between the dura mater and the arachnoid. In many patients, it develops slowly after a mild head trauma often overlooked by them [9], but the number of patients without a history of trauma is increasing, probably due to anticoagulant or antiaggregant treatment [8]. Although cases of spontaneous recovery [1,10] and recovery with medical treatment (corticosteroid or atorvastatin-based) [6] have been reported, the treatment of CSDH is mainly surgical. Surgery for chronic subdural hematoma itself is based on several techniques, including evacuation through a small bone flap associated or not with a drainage system or through one or more burr-holes also associated or not with a system of continuous drainage or percutaneous twist drill craniostomy. The optimal surgical procedure is still subject to debate.

The purpose of this study was to compare the clinical outcome of patients who had chronic subdural hematoma evacuation and drainage through a single burr hole craniostomy and those who had chronic subdural hematoma evacuation and drainage through a minicraniotomy.

Materials and method

We carried out a retrospective study on 101 patients who were hospitalized in the neurosurgery department of the teaching hospital of Bouaké between July 1, 2016 and June 30, 2020 for the management of a chronic subdural hematoma. Due to the retrospective nature of this study, no consent was given and all records have been anonymised. The diagnosis of chronic subdural hematoma was made by CT scan without injection of contrast medium. We compared the data of the patients who had been operated by a burr hole craniostomy (group A) and those of those who had been operated by a minicraniotomy (group B). Patient data was collected from records available in the neurosurgery department. The following parameters were analyzed: age, sex, history, clinical and paraclinical signs, the etiology retained, the surgical technique used, the complications and the clinical course. During the postoperative period, regression of signs and symptoms of CSDH was expected as clinical improvement. Data were entered and statistically analyzed using IBM SPSS 22.0. Fisher's exact test, chi-squared and Student's t-test were performed to compare the 2 groups. All the tests were bilateral. The P-value (P) <0.05 was considered statistically significant.

Surgical technique

In group A a single burr-hole was made while in group B it was a minicraniotomy. The technique used was the choice of the surgeon. All patients (regardless of the technique) were operated under general anesthesia with endotracheal intubation. A skin incision of 4 to 5 centimeter was made across the maximum thickness of CSDH. A burr hole craniostomy of 1 centimeter diameter was performed in group A, followed by a cruciform opening of the dura mater and outer membrane of CSDH after thermo coagulation. In group B, instead of the burr hole craniostomy, a bone flap of 3 centimeter diameter was cut with the trephine. Subsequently, like group A, the dura mater and the outer membrane of the hematoma were incised crosswise after their thermo coagulation. whatever the group, rinsing of the subdural space was performed with isotonic saline (0.9%) until the rinsing liquid returned clear followed by drainage of the subdural space with a closed system. by siphoning (depending on gravity without continuous suction). In group B, the dura is sutured around the drain followed by placement of the bone flap. In group A, the same closed siphoning subdural drainage system is put in place but the dura is left open. In bilateral subdural hematoma, surgery was done bilaterally. Regardless of the technique used, the inner membrane of the hematoma as well as the arachnoid were not open. The rest of the care is identical in both groups. It consisted of suturing the surgical wound followed by the dressing. Patients were strictly bedridden for 48 hours and, the drainage bag is placed on the patient's bed. The drains were removed in all the patients after 48 hours.

Results

During our study period 102 patients were treated for a chronic subdural hematoma, including 1 patient treated medically (corticosteroid therapy) and 101 others treated surgically, i.e. 99%.

A total of 101 patients were included in this study, 46 in group A (patients who had burr hole craniostomy) and 55 in group B (patients who had mini-craniotomy). Our study population had a mean age of 59.7 +/- 13.35 years with extremes of 24 and 100 years. Patients under the age of 65 years accounted for 69.3% and those aged 65 years and over represented 30.7%. There were 24 women (23.8%) and 77 men (76.2%).

The demographic, clinical and paraclinical characteristics of patients before their surgical treatment are summarized in Table 1.

The clinical evolutionary aspects of the patients are presented in Table 2.

Clinical examination at 3 months and 1 year postoperatively showed full recovery in the 97 patients who survived.

Table 1. Characteristics of patients before their surgical treatment.

variables	Group A(burr hole craniostomy), N = 46 (45.5%)	Group B (mini-craniotomy), N = 55 (54.5%)	Total (N = 101)	test	P value
Age (years)	59.5 +/-14.56 (min = 24 and maxi = 100)	59.8 +/-12.396 (min = 26 and maxi = 84)	59.7 +/- 13.35 (min 24 and maxi = 100)	t-student = 0.139	P = 0.89
gender				X^2 = 0.252	P = 0.645
male	34 (74)	43 (78.2)	77(76.2)		
Female	12 (26)	12 (21.8)	24(23.8)		
Aetiology				Fisher = 2.134	P = 0.372
Head trauma	31 (67.4)	40 (72.7)	71(70.3)		
Hemostatic disorder	0	2 (3.63)	2(1.98)		
No cause identified	15 (32.6)	13(23.6)	28(27.72)		
delay (trauma and diagnosis (days)	31	30.7			
Symptoms					
headache	35(76%)	42(76.3%)	77(76.2%)		
vomiting	9(19.5%)	11(20%)	20(19.8%)		
behavior disorder	7(15.2%)	8(14.5%)	15(14.8%)		
Epileptic seizure	1(2.1%)	1(1.8%)	2(1.9%)		
mean Glasgow score on admission	13.22 +/-2.511 min = 6 et max = 15	13.4 +/- 2.257 min = 7 et max = 15	13.32+/-2.366 Min = 6 Max = 15 Mode = 15	t-student = 0.385	P = 0.701
Motor deficit on admission	34 (74%)	46 (83%)	80(79.2%)	X^2=1.438	P = 0.23
Co-morbidities				Fisher = 12.51	0.27
Chronic arterial hypertension	6(13%)	8(14.5%)	14(13.8%)		
Chronic alcoholism	8(17.4%)	5(9%)	13(12.8%)		
Parkinson disease	0	1(1.8%)	1(0.9%)		
Hepatocellular insufficiency	0	1(1.8%)	1(0.9%)		
HIV Infection	0	2(3.6%)	2(1.9%)		
tuberculous Meningitis	1(2.1%)	0	1(0.9%)		
Heart disease under diuretics	0	1(1.8%)	1(0.9%)		
Stroke and chronic hypertension	1(2.1%)	1(1.8%)	2(1.9%)		
blindness	0	2(3.6%)	2(1.9%)		
prostatic Adenocarcinoma	1(2.1%)	0	1(0.9%)		
No comorbidity	27(58.7%)	34(61.8%)	61(60.4%)		
location				Fisher = 1.787	P = 0.455
Right	16 (15.8%)	22 (21.8%)	38(37.6%)		
left	24(23.8%)	30(29.7%)	54(53.4%)		
bilateral	6 (5.9%)	3 (3%)	9(8.9%)		

Table 2. Evolution of patients according to the surgical technique used.

variable	Group A (burr hole craniostomy), n = 46 (45.5%)	Group B (minicraniotomy), n = 55 (54.5%)	Total (n= 101)	test	P value
Evolution of consciousness 48 hours postoperatively	14.58 +/- 1.59	14.65+/-1.30			P = 0.81
Improvement in motor skills 48 postoperatively	31(67.39%)	44(80%)	75(74.25%)	X^2= 4.03	P = 0.133
immediate post-operative Complications	7(15.21%)	4(7.27%)	11(10.89%)	Fisher = 6.223	P = 0.172
Clinically manifested Pneumencephaly	3(6.5%)	2(3.6%)	5(4.9%)		
Acute bleeding	0	2(3.6%)	2(1.9%)		
Brain Contusion	1(2.1%)	0	1(0.9%)		
Brainstem haemorrhage	2(4.3%)	0	2(1.9%)		
post-operative Epilepsy	1(2.1%)	0	1(0.9)		
Recurrence during the first year	2(4.3%)	2(3.6%)	4(3.96%)	Fisher = 1.57	P = 0.55
3 months Outcome				X^2 = 0.483	P = 0.328
mortality rate	3(6.5%)	1(1.8%)	4(3.9%)		
Full recovery	43(93.4%)	54(98.1%)	97(96%)		

Discussion

Chronic subdural hematoma (CSDH) is one of the most common neurosurgical conditions. Its incidence increases considerably with age and ranges from approximately 3.4 per 100,000 in patients younger than 65 years old to 8 to 58 per 100,000 among those over 65 years [2,16]. Contrary to observations made in developed countries, our study population consists mainly of patients under the age of 65 (approximately 70% of our patients). This is partly explained by the characteristics of the Ivorian population, which is made up mainly of young people. Indeed 97.15% of the Ivorian population is under 65 years old with a life expectancy of 61.8 years [17]. Karibe H et al like Rauhala M et al. in their various studies carried out in Japan and Finland respectively, showed that the incidence of chronic subdural hematoma increased with age [7,13]. Some authors have also found an average age of occurrence of chronic subdural hematomas less than 65 years, such as Mwanyombet et al in Gabon [9] who observed that 80% of their patients were between 60 and 65 years old; Jaiswal et al in India reported in their series an average age of 53 years [5]. We also observed a male predominance. The sex ratio in our study was 3.2: 1. The higher incidence in men may be due to higher rates of head trauma in them. Head trauma has been identified as the most common factor associated with 25% to 75% of cases of CSDH in most studies. In our study, a head trauma was reported in 70% of patients. This proportion varied according to the studies: in that of Goyal RK, it was 75% [3], in that of Santarius et al. it was 61% [15], in that of Zumofen et al. it was 79.6% [20] and in that of Ramachandran and Hegde it was 56% [12].

Although spontaneous resolutions [10] or under medical treatment of chronic subdural hematomas [4] have been reported, the treatment of chronic subdural hematomas is resolutely surgical. The treatment decision is based on clinical manifestations and radiological signs including the volume of the hematoma and its mass effect on the parenchyma [18]. Several surgical techniques have been described, however, no study can formally conclude the superiority of a technique in terms of efficiency and safety. In our study, we concluded that the two evacuation and drainage procedures that are burr hole craniostomy and minicraniotomy gave similar results in terms of complications, recurrence rate and neurologic course.

No statistically significant difference was observed in the clinical course of patients either in the immediate postoperative period or in the medium and long term. In fact, there was no statistically significant difference in the evolution of the consciousness and motor deficit in the two groups. The occurrence of postoperative complications were also statistically superimposable in the two groups as were the recurrence rates. Therefore, the two techniques had identical efficiencies. Regan M. et al, after a comparative study of these 2 surgical techniques, concluded that evacuation by craniotomy was associated with a higher re-operative rate (24.1%) than evacuation by burr hole craniostomy with P = 0.0156 [14]. They argued that the re-operation was mainly due to a residual chronic subdural hematoma or secondary to one or more acute haemorrhages. Their result was related to the lack of drainage in their patients who had had craniotomies. Weigal and. Al. Had shown in a study that the use of a closed drainage system reduced the risk of recurrence of hematoma [19] and therefore of the need for re-operation. Santarius et al. in a randomized study comparing two groups of patients treated for CSDH by burr holes craniostomy, one group having had drainage and the other not. Those with drain were found to have a lower reoperation rate due to a decrease in hematoma recurrence [15]. However, Raghavan A et al. for their part found that burr hole craniostomy was associated with a higher re-operative rate [11]. The recurrence rate was relatively low in our series compared to that reported in the literature, especially the series from developed countries. The low rate of recurrence in our series could be explained by the characteristics of our population which was essentially made up of young adults with very little cerebral atrophy on the one hand and on the other hand by a low rate of comorbidity requiring the taking antiaggregant or anticoagulant. Indeed, it is accepted that cerebral atrophy and increased subdural space observed in elderly patients make them vulnerable to the development of chronic subdural hematomas [5]. Also according to Regan M. et al. in their series, there was a higher incidence of postoperative complications in the craniotomy group than in the burr hole craniostomy group. Moreover, it clearly appears that the duration of the procedures was significantly longer in craniotomies than burr holes craniostomies [14]. We were unable to compare the duration of different surgeries in our study due to unavailability of data.

Conclusion

Evacuation and drainage of chronic subdural hematoma by burr hole craniostomy or mini-craniotomy are comparable in terms of clinical outcome. However, other factors not analyzed in our study, such as surgical procedure duration and the type of anesthesia, could help surgeons to choose the appropriate surgical technique on a case-by-case basis. Future prospective, randomized, multicenter studies taking into account several factors that may influence surgery for chronic subdural hematoma and the vital and functional prognosis of patients are needed.

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