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A Comparative Study between Surgical and Medical Treatment

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Abstract

Objective: *To study and compare the effectiveness and outcome of the surgical treatment versus medical management of patients with spontaneous supratentorial intracerebral hemorrhage (ICH).*

Methods: *A comprehensive review of 35 patients with spontaneous supratentorial ICH is preformed at Benha university hospital and King Fahd general hospital from March 1999 to September 2001. Twenty patients had surgery for clot evacuation through open craniotomy and fifteen received medical management. Inclusion criteria were Glasgow Coma Score > 5 at the time of enrollment, with focal neurological deficits, ICH volume > 20 cc on the initial brain CT scan. The follow up period was three months. Outcome was defined using the Glasgow Outcome Scale (GOS). A good outcome was defined as GOS score > 3 at 3 months.*

Results: *Overall the results of management of spontaneous supratentorial ICH either by surgical or medical treatment is potentially confounded and inconclusive. Fourty six percent of the patients died (GOS 1), 34% remained severely disabled (GOS 3) and 20% became independent with moderate disability (GOS 4).The likelihood of a good outcome (GOS >3) for the surgical treatment group differ from the medical treatment group (25% vs.*

13%). There was no significant difference in mortality at 3 months (45% vs. 46.6%). At the end of the follow up period, the median GOS score showed a nonsignificant trend towards a better outcome in the surgical treatment group against the medical treatment group (56% vs. 53%).

Conclusions: *Craniotomy with clot evacuation for spontaneous supratentorial ICH may result in functional independence in approximately a quarter of patients (5 out 20). Despite this, there is no clear indication from this study for the optimal treatment of these patients either through aggressive surgical intervention or conservative medical management.*

Key Words : *Intracerebral hemorrhage- medical treatment-surgical treatment- craniotomy, herniation, basal ganglion hematoma.*

Introduction

Primary intracerebral hematoma (ICH, unrelated to aneurysm, arteriovenous malformation, trauma, or tumor) only accounts for 10% to 20% of stroke but carry very high mortality (38% to 52% at 30 days) and morbidity rates (Only 20% of the survivors are independent at 6 months) of all stroke subtypes. It is also the most common type of stroke in the younger patient (aged <50 years) Bamford et al., 1990. The initial treatment plan of ICH remains to be unclear and surgery has not been shown conclusively to be superior to supportive medical care in meta-analyses of randomized trials (Broderick et al, 1999, Donauer and Faubert., 1992 and Fayad and Awad., 1998) Moreover the best management of deteriorating patients with ICH with signs of cerebral herniation is equally uncertain. Consequently, indications for aggressive intracranial pressure management and emergency surgery are not known Niizuma and Suzuki., 1988. In younger patients, surgery generally is offered in anticipation of better prospects of recovery. However, even in these cases it is unknown whether surgery can make functional recovery possible. There is a wide variation in the management of ICH among different neurosurgeons and neurologists throughout the world and even in single centers Broderick et al., 1994.

Advancing age and hypertension are the most important risk

factors for spontaneous ICH. A pathophysiological change in small arteries and arterioles due to sustained hypertension is generally regarded as the most important cause of ICH Takebayashi., 1885.

The aim of this study was to review the clinical and radiological prognostic factors in patients with spontaneous supratentorial ICH and to compare the outcome in patients who were treated surgically with those who were managed medically.

Patients and Methods

Patients with spontaneous supratentorial ICH who presented to two neurosurgical centers and underwent surgical evacuation through open craniotomy were compared with those who were managed medically. Inclusion criteria were spontaneous supratentorial ICH, age > 35 years, GCS score of >5 at the time of admission, focal neurological deficit, ICH volume > 20cc on initial brain CT scan. The management were started within 24 hours of onset of clinical symptoms and initiation of surgery within 48 hours from admission. The choice of modality of treatment was dependant on the availability of informed surgical consent, which was obtained from the patient or from his legally designated representative. We collected data on age, sex, history of hypertension or diabetes, and use of antiplatelet or anticoagulant drugs. The physical examination at admission included an assessment of the level of consciousness by the Glasgow Coma Scale (GCS) score on arrival, the presence of hemiplegia or , extensor posturing and brainstem reflexes (pupillary light reflex, corneal and oculocephalic reflexes) . Presence of coma in combination with unilateral or bilateral fixed dilated pupils, loss of brainstem reflexes, or extensor posturing were considered signs of clinical brain herniation. Radiological herniation was defined by the presence of downward displacement of the temporal uncus or midline shift of the septum pellucidum > 1 cm on the initial brain CT scan. The radiologic features were analyzed as regards to ICH location, basal cistern effacement, contralateral hydrocephalus and presence of hemoventricle. The formu-

la ABC/2 was used to calculate ICH volume, where A is the greatest hemorrhage diameter by CT, B the diameter 90 degree to A and C is the approximate height of CT slices with hemorrhage (table 1). Outcome was defined according to the Glasgow Outcome Scale (GOS): GOS 1 = death; GOS 2 = persistent vegetative state; GOS 3 = severe disability, dependent; GOS 4 = moderate disability but independent; GOS 5 = full recovery or minimal disability. Patients were categorized further into two groups: poor outcome group = GOS ≤3 and good outcome group = GOS > 3 Jennett and Bond., 1975. Outcome was measured at the time of discharge and / or at 3 months, with the Glasgow Outcome Scale (GOS) score as the major end point in this study (table 2). The surgically and medically managed groups were compared with respect to clinical presentations, radiological features and outcome (table 1 ,2).

Surgical Treatment :

After obtaining the informed surgical consent, the patients were taken to the operating room as soon as possible. Craniotomy was the standard approach for removal of ICH. Its major advantage is adequate exposure to remove the clot. The surgical approach was individualized on the basis of the site and size of the ICH with the use of standard neurosurgical techniques. The goals of surgical treatment were incomplete removal of the clot to avoid further brain damage and possibility of uncontrolled bleeding from the wall of the clot cavity particularly in patients with deep-seated hemorrhage.

Medical Treatment :

All patients were admitted to the intensive care unit for at least the first 24 hours or until they are considered stable enough to be in an intermediate care or general unit. Treatment of ICH was according to current practices at both centers and was not rigidly regimented. The primary attending neurosurgeon; and intensive care unit (ICU) physician were allowed to use their best clinical judgment.

Management of blood pressure :

Particular attention was paid to

control the blood pressure, where optimal level of a patient s blood pressure was based on individual factors such as age, chronic hypertension and elevated intracranial pressure (ICP). In general, recommendation for treatment of elevated blood pressure in patients with ICH is more aggressive to decrease the risk of ongoing bleeding from ruptured small arteries and arterioles. Conversely, over aggressive treatment of blood pressure may decrease cerebral perfusion pressure and worsen brain injury, particularly in the setting of increased intracranial pressure. To balance these rationales, mean arterial blood pressure (MAP) should be maintained between 100 and 130 mm Hg by appropriate antihypertensive therapy.

Management of increased intracranial (ICP)

Raised ICP is considered a major contributory factor to mortality after ICH, thus, its control is essential. ICP were managed through osmotherapy, controlled hyperventilation and barbiturate coma. Although universally accepted standardized therapy for elevated ICP has not been established Boroderick et al., 1999 however in general, if hyperventilation is instituted for elevated ICP, Pco2 should be maintained between 30 and 35 mm Hg. High dose of barbiturate therapy should be viewed as an option and not part of a standardized algorithm in the treatment of elevated ICP in patients with ICH. Short acting barbiturates such as thiopental are known to effectively reduce elevated ICP by reducing cerebral blood flow and volume of the normal brain and also it reduces brain swelling perhaps as a result of mild systemic hypotension and acts as free radical scavengers. In addition,most patients will require sedation with agents such as propofol, midazolam, or morphine as well as skeletal muscle relaxation.

Other medical management issues

Particular attention was also paid to fluid and electrolyte balance. Optimal central venous pressure (CVP) was maintained between 5 and 12 mmHg. Changes in blood Ph were corrected according to results of blood gas analysis.

pearance after craniotomy was not a reliable predictor of good outcome.

There was little difference in good outcome rate between surgically & medically managed groups in this study (26% verses 13 % respectively) at 3 months. There was no significant difference observed in mortality at 3 months in surgically treated group 45% (9 out of 20 patients) and in medically treated group 46.6% (7 out of 15 patients). No intraoperative death was observed. No patients in this study regained their full independent pre-illness normal life style. Results of the outcome showed a no significant deference toward one of treatment modality for spontaneous supratentorial ICH, in surgical treatment group the survivors were 11 out of 20 patients (56%) compared with 9 out of 15 patients (53%) in medical treatment group (Table 3).

Table (1) : Clinical presentations and Radiological Findings in both surgically and medically treated patients

Treatment / Variables	Total N = 35	Surgical N = 20	Medical N = 15
Age ,y, mean (range)	54.9 (35-65)	53.5 (35-65)	56.9 (45-65)
Sex	M=26	M=15	M=5
	F=9	F=5	F=10
Hypertension	35	20	15
Diabetes	20	7	13
Anti-coagulant drugs	5	1	4
Glasgow Coma Scale	5-13	5-13	5-10
Hemiplegia	25	10	15
Hemiparesis	10	10	–
Clinical signs of herniation	20	10	10
Initial CT finding	35	20	15
Right hemispheric H.	23	16	7
Left hemispheric H.	12	4	8
Lobar ICH	19	13	6
Basal ganglionic ICH	15	6	9
Medline shift	35	20	15
Basal cistern effacement	28	15	13
Contra-lateral H/C	12	4	8
Hemoventricle	14	4	10
ICH volume mean (range)	53.8 cc(20-80)	50 cc (20-60)	59 cc (25-80)

Table(2) : Comparison of outcome measures in the surgical and medical groups

Glasgow Outcome scale (GOS)	Surgical group(n=20)	Medical group (n=15)	Total (n=35)
GOS = 1	9 (45%)	7 (46%)	16 (46%)
GOS = 2	2 (10%)	3 (20%)	5 (14%)
GOS = 3	4 (20%)	3 (20%)	7 (20%)
GOS = 4	5 (25%)	2 (13%)	7 (20%)
GOS = 5	-------	-------	-------

Table(3): Clinical and radiological variables related to outcome in both surgically and medically treated patients with ICH

Results / Variables	Poor outcome GOS < 3 N=28 (80%)		Good outcome GOS > 3 N=7 (20%)	
	Surgical N = 15	Medical N = 13	Surgical N = 5	Medical N = 2
Age (mean)/year	55.4	58.4	47.8	47
Diabetes	5	13	2	--
Anti-coagulant	--	1	1	3
GCS (mean)	6	6	8	9
Clinical signs of herniation	10	8	2	--
Basal ganglionic ICH	6	9	--	--
Left hemispheric ICH	4	7	1	--
Right hemispheric ICH	10	7	4	2
Contra-lateral H/C	4	8	--	--
Hemoventricle	4	10	--	--
Volume of ICH (mean)	50 cc	60cc	45cc	50 cc

Table(4): Reported clinical variables in the most common studies on the effect of surgical vs. medical treatment in spontaneous supratentorial ICH

Year of Publication	No. of cases	Poor Outcome (%)	Clinical predictors Of poor outcome	Comments
Helwrg – Larsen et al., 1984	M = 11 S = 9	M = 64 S = 44	None reported	No patients with GCS <6 included
Fujitsu et al., 1990	M = 17 S = 17	M = 69 S = 50	None reported	No patients with GCS <5 included
Donauer & Faubet 1992	M = 26 S = 26	M = 81 S = 96	GCS <10	Patients with no response to pain excluded
Fayad &Awad 1998	M = 50 S = 50	M = 74 S = 58	Stupor or coma	Limited to endoscopic surgery and age < 60 benefit from surgery
Fernades and Mendelow 1999	M = 13 S = 8	M = 85 S = 75	None reported	Patients with posturing or coma excluded
Our study	M = 15 S = 25	M = 86 S = 75	Old age,herniation Basal ganglia, and IVH, contra-lateral H/C	Non randomized study

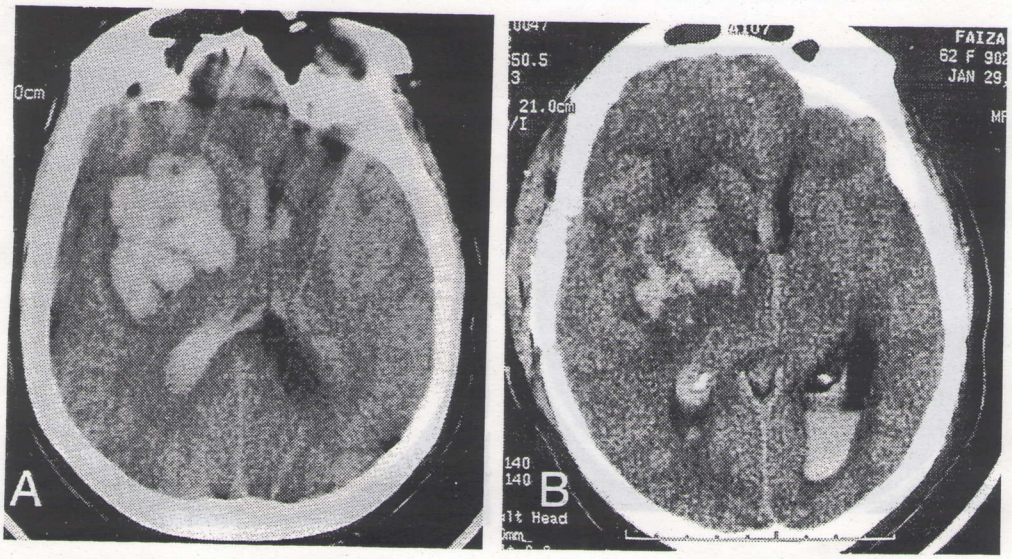

Fig. 1 : (A) Pre-Operative. **(B)** Post-Operative.

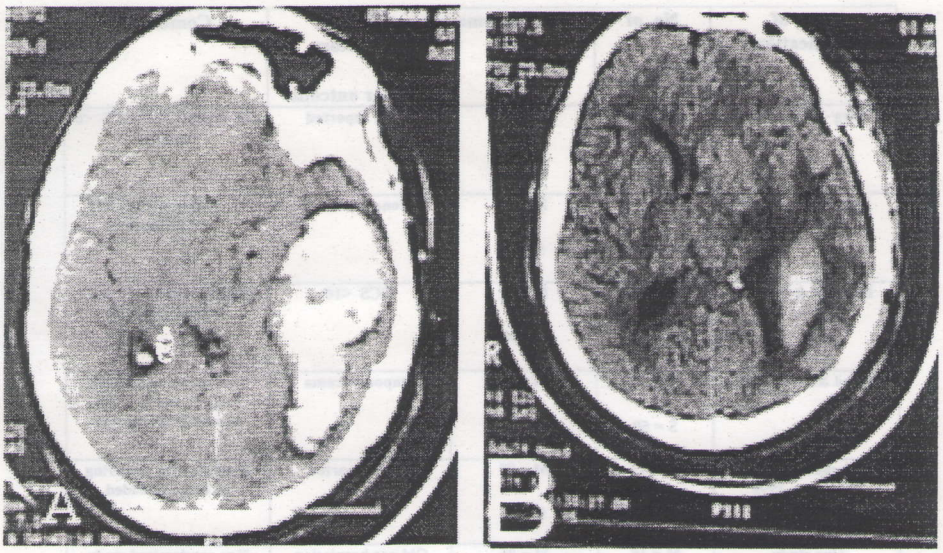

Fig. 2 : (A) Pre-Operative. **(B)** Post-Operative.

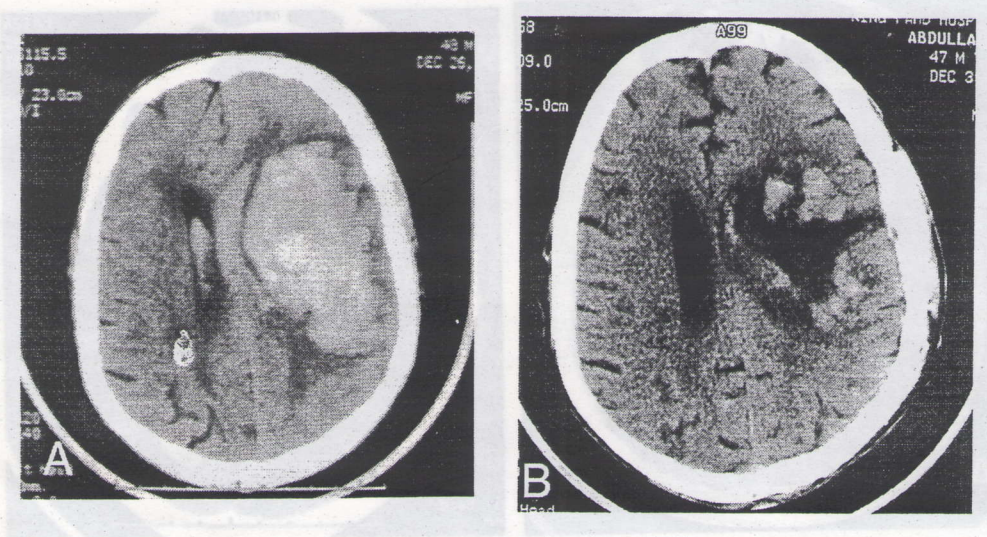

Fig. 3 : (A) Pre-Operative. **(B)** Post-Operative.

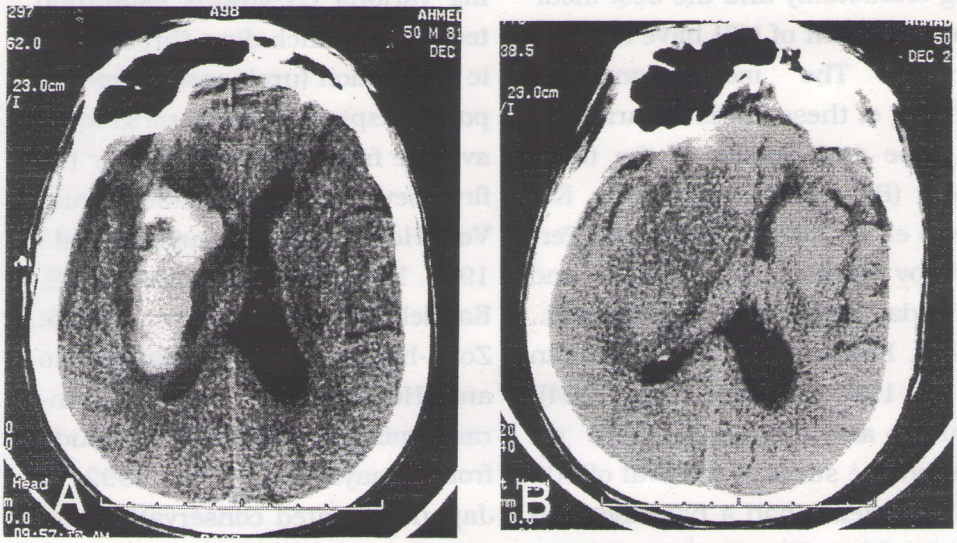

Fig.4 :(A) Before medical treatment. **(B)** After medical treatment.

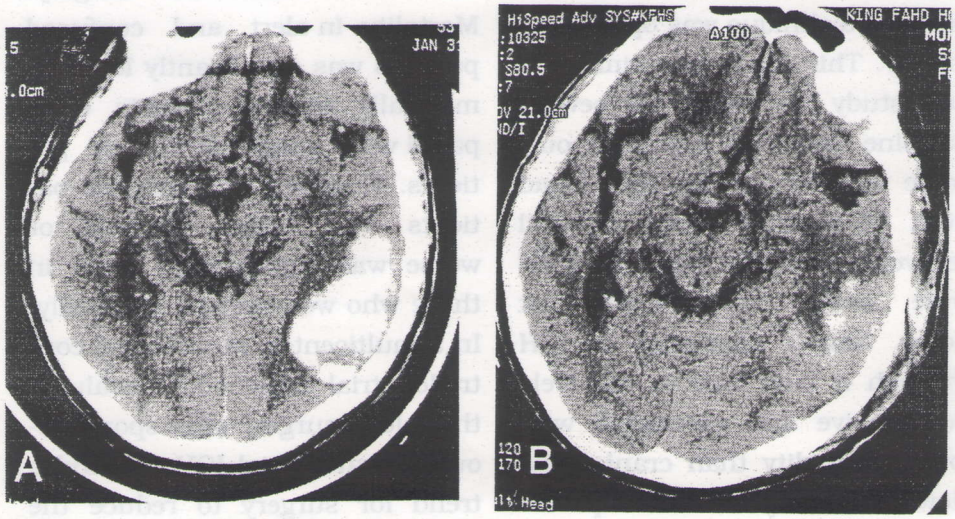

Fig.5 :(A) Before medical treatment. **(B)** After medical treatment.

Discussion

Nonrandomized series comparing craniotomy and the best medical treatment of ICH have been reported. The most consistent finding of these series is variability in type and results of the treatment (Broderick et al., 1994, Kaneko et al., 1977, Kandel and Peresedov et al., 1985, Kanaya and Kuroda., 1992, Kase and Crowell., 1994, Fujitsu et al., 1990, Volpin et al., 1984, Helwege et al., 1984). Kaneko and colleagues., 1983 reported the surgical removal of 100 ICH, patients had a baseline GCS score of 6 to 13 with obvious hemiplegia. Most of patients had a lobar hematoma with volume of more than 20 to 30 cc, with a midline shift of more than 5 mm. The surgical technique was open craniotomy. This study was similar to our study as regard to several baseline variables, and their outcome was 50 patients (50%) had died, 15 patients (15%) had full recovery, and 35 patients (35%) were living independently at home. Simple aspiration of ICH through a burr hole is relatively noninvasive and associated with lower morbidity than craniotomy. However, early series reported poor localization of the hematoma and inadequate removal Juvela et al., 1989. Other investigators using various CT-guided aspiration techniques, including thrombolytic instillation (urokinase), have reported aspiration rates ranging an average from 30% to 90% over the first several days (Backlund and Von Holst., 1978, Nguyen et al., 1992, Niizuma and Suzuki., 1988, Kandel and Peresedov., 1985, Zong-hui et al., 1991, Matsumoto and Hondo.,1984). A large nonrandomized, multicenter study from Kanaya and Kuroda 1992, in Japan evaluated conservative and surgical treatment of putaminal hemorrhage during the 1980s., of the 7010 patients studied, 3635 received medical treatment alone and 3375 underwent surgery. Mortality in alert and confused patients was significantly lower in medically treated patients compared with surgically treated patients. However, mortality in patients who were stuporous or worse was significantly lower in those who were treated surgically. In a multicenter, randomized controlled trial designed to evaluate the role of surgery after spontaneous supratentorial ICH, we find a trend for surgery to reduce the chance of death and dependency

(Juvela et al., 1989, Auer et al., 1989, Batjer et al., 1990, Morgensterm et al., 1998, Zuccarello et al., 1999) (Table 4).

The validity of the prognostic factor has been confirmed in this study as well as in the other series (Da Pian et al.,1984, Diringer et al.,1998, Zumkeller et al.,1992), older age, initial GCS ≤7, clinical signs of herniation, basal location, hemoventricle and contralateral hydrocephalus were found to be predictive of worse outcome. However, use of anti-coagulants, the ICH volume,and midline shift were less valuable prognostic factors.

Conclusion

The lack of a proven medical or surgical treatment for ICH leads to great variation among physician concerning its management plan. The safety, effectiveness, with maximum preservation of neurological function are the major goals of the treatment of patients with spontaneous ICH, but unfortunately, at the present time, neither surgical nor medical treatment can be the ideal modality of choice for the management of ICH. Perhaps in the future with the advancement of minimal invasive neurosurgical techniques and neuroanesthesia, surgical intervention may become more safe and offer preservation of neural tissues. On the other hand the advances of the intensive care monitoring systems and neuromedications may make the medical treatment more effective and improve the dismal outcome of most patients with spontaneous ICH.

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