

ORIGINAL RESEARCH

A Study to Evaluate the Efficacy of Dexamethasone in Patients with Chronic Subdural Hematoma and Assessment of Initial Treatment Assignment According to Markwalder Grading Scale

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ABSTRACT:

Introduction: Treatment of chronic subdural hematoma has improved dramatically in recent years because of advances in diagnosis and surgical techniques. However, there is still some debate regarding the best strategy for treatment. In our department, we have been using dexamethasone for the treatment of symptomatic chronic subdural hematoma. Through our study we intend to discuss effectiveness and safety of corticosteroid therapy in chronic subdural hematoma and its implications for the clinical practice.

Materials and Methods: Upon admission, all patients were graded according to their functional neurological condition according to Markwalder Grading Score classification, patients scoring MGS 0-1-2 (alert, orientated and those drowsy or disorientated with possible variable neurological deficits) were assigned to the Dexamethasone Protocol whereas patients in MGS 3-4 (stuporous or comatose) were, in general, assigned to the Surgical Protocol. Some patients in grades 3-4 were also initially treated with dexamethasone as it is discussed below. For 20 patients under MGS 0,1 no treatment was instituted. No patient was left untreated in the case of severe neurological deterioration or due to extreme age. Non contrast cranial CT scan was used for initial diagnosis and follow up in all cases.

Results: In Dexamethasone group only 1 (1 out of 20, 5%) patient deteriorated and was subjected to surgery, other 19 (95%) patient improved. In Patients where treatment was not administered in any form 14 (70%) patients had favourable outcome and 6 (30%) patients were subjected to surgery. Patients from MGS grade 1 and 2 who were treated with dexamethasone have better results as compared to not treated with any modality (95% vs 70%). Patients treated with dexamethasone along with surgery (94.28% had favourable outcome) had better outcome than patient who underwent only surgery (83.33% had favourable outcome). All patients readmitted (6.66%) did well. Mortality was very low for whole series (0.8%).

Conclusion: This novel therapeutic approach to Chronic subdural haematoma opposes the traditional view of neurosurgeons that are prone to indicate early surgery supported by good results obtained in thousand of cases before. In early presentation with minimal neurological deficit; glucocorticoids reduce progression of disease and need of surgery. Thus, there is a role of medical treatment in a selected group of patients with CSDH. Well-designed, multicenter, randomized controlled trials are required further to define the indications and standard protocols for the medical treatment of CSDH.

Keywords: Chronic Subdural Haematoma; Dexamethasone; Glucocorticoids; Markwalder Grading Score.

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INTRODUCTION

The chronic subdural hematoma is defined as a 'chronic, self-perpetuating inflammatory process that involves the dura mater' was given by Frati and confirms the inflammatory nature of this disease.¹ Neurosurgeons around the globe are familiar with this condition and many of them consider symptomatic chronic subdural hematoma a clinical scenario that requires prompt specialized evaluation and neurosurgical intervention, often on an emergency basis. At present, burr hole, twist drill craniostomy and drainage are the most widely used surgical techniques.^{2,3}

Although the overall morbidity and mortality associated with surgical drainage are low, it seems reasonable to offer less aggressive measures, to patients. Successful resolution of chronic subdural hematoma either spontaneously or after medical treatment has been reported before, even for severely impaired patients.^{4,5} Systemic steroid therapy has been used in Chronic subdural hematoma as an alternative to surgical evacuation in selected patients. The rationale for its use lies on the complex effects of corticosteroids over the clot membrane and neovascularization.^{6,7}

Treatment of chronic subdural hematoma has improved dramatically in recent years because of advances in diagnosis and surgical techniques. However, there is still some debate regarding the best strategy for treatment.⁸⁻¹⁰ In our department, we have been using dexamethasone for the treatment of symptomatic chronic subdural hematoma. Through our study we intend to discuss effectiveness and safety of corticosteroid therapy in chronic subdural hematoma and its implications for the clinical practice.

MATERIALS AND METHODS

The present descriptive and prospective study was carried out at Department of Neurosurgery, B J Medical Collage and Civil Hospital, Ahmedabad, Gujarat (India) among all the patients with chronic subdural hematoma (Markwalder grading scale 0,1,2,3,4) seen at neurosurgery OPD and ward between September 2018 to January 2021. Ethical approval was obtained by the Ethical and Research committee of the institute. Various parameters for medically treated patients and those subjected to surgery were noted. The subjects were identified since admission, ward notes of patient and the main operation theatre register and their case notes were retrieved from the medical records department and patients with follow up in routine visits. A proforma questionnaire was used to record all the required information. A specimen of which is annexed as appendix. Inclusion criteria comprised of patients aged above 18 years, patients with chronic or subacute; uni or bilateral subdural hematomas which were confirmed by cerebral computed tomography scan

without contrast enhancement (and addition CT scan is mandatory for patients with chronic subdural hematoma diagnosed using another imaging modality eg. MRI), Markwalder grading scale 1 and 2 for dexamethasone protocol and Markwalder grading scale 3 and 4 for surgical protocol and patients who provided written informed consent from patients or their next of kin according to patient's cognitive status. Exclusion criteria comprised of cases with clinical [GCS \leq 12, motor deficits $<$ 4/5] and radiological signs of severity [midline shift $>$ 5mm, uncal transtentorial herniation, patients with uncontrolled diabetes mellitus, contraindications to dexamethasone, hypersensitivity to dexamethasone, pregnant and nursing women, known peptic ulcer, acute systemic infection, glaucoma, parasitic infection, current or previous history of severe affective disorder and patients unlikely to comply the protocol.

Upon admission, all patients were graded according to their functional neurological condition. According to Markwalder Grading Score classification, patients scoring MGS 0-1-2 (alert, orientated and those drowsy or disorientated with possible variable neurological deficits) were assigned to the Dexamethasone Protocol whereas patients in MGS 3-4 (stuporous or comatose) were, in general, assigned to the Surgical Protocol. Some patients in grades 3-4 were also initially treated with dexamethasone as it is discussed below. For 20 patients under MGS 0,1 no treatment was instituted. No patient was left untreated in the case of severe neurological deterioration or due to extreme age. Non contrast cranial CT scan was used for initial diagnosis and follow up in all cases.

Dexamethasone protocol consisted of administration of 4 mg of dexamethasone every eight hours, either oral or intravenous for duration of 21 days; bed rest; oral diet if possible (or through nasogastric tube) or fluid reposition, depending on the level of consciousness; pantoprazole (40 mg BD per day); and prophylaxis of thrombophlebitis with lower-limbs pneumatic compression device. Patient's neurological status is checked every day and the effectiveness of corticotherapy is re-evaluated after 48-72 hours. Those patients not improving their MGS are proposed for the Surgical Protocol. The rest are either allowed to ambulate or discharged and dexamethasone is slowly tapered until complete withdrawal. Clinical and radiological evaluation is performed after 6 weeks (in the Outpatient Office) and further on until complete cure or clinical-radiological stabilization. The treatment duration of 21 days is supported by the pathophysiology of chronic subdural hematoma formation.

We advocate for the performance of a single (or double, in bilateral CSHs) burr hole over the affected hemisphere, preferably in the frontal and parietal region. The procedure is done with the patient supine

under local anaesthesia or general anaesthesia. We use a 12 mm diameter manual or motored perforator intending to create a small burr holes as parallel as possible to the inner table of the skull in order to minimize the risk of brain penetration. The evacuation of altered coloured blood done after opening dura followed by irrigation with normal saline without pressure. A ventricular catheter is inserted in the subdural space and a moderate quantity of liquid is allowed to exit. The catheter is connected to a collecting device located at least 20-30 cm below the patient's head, letting the fluid out *drop-by-drop*. The bloody CSF outflow rate is thus controlled intending to avoid pneumocephalus or contralateral haematomas. The drainage is maintained 48-72 hours. Surgical time rarely exceeds 30 minutes. Antimicrobial prophylaxis is maintained as long as the catheter remains inserted (intravenous Cefosulbactam 1.5gr/8h or Vancomycin 1g/12h)⁷⁹. Clinical re-evaluation is done after drainage withdrawal. Patients not clearly improving after drainage are initiated on dexamethasone as an adjuvant therapy. Some cases needed a second drainage due to re-accumulation of liquid and very few underwent craniotomy and membranectomy. The latter technique was reserved for unresponsive and rapidly deteriorating patients. The same follow up protocol as in medical patients applies in this group. Median follow up time for each patient was 25 weeks.

Clinical outcome is described below on the basis of the last history note written by the surgeon who treated the patient, so that every patient achieved one of three possible endpoints: complete cure, clinical stabilization not requiring further treatment and complications like re- surgery and death. Data analysis does not include p-values for statistical parameters since the design of this study and sample size (small N values in subsets) do not allow direct comparisons among the different treatment groups. The data collected was entered into the SPSS -20 computer software program for processing.

RESULTS

Initial treatment assignation was as follows, 20 patients no treatment were administered, 20 patients underline dexamethasone protocol, 70 patients were given dexamethasone along with craniotomy with subdural drain and 30 patients underwent craniotomy with subdural drain. Treatment assignation depending on the MGS at admission is shown in table 1.

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patients underline dexamethasone protocol, 70 patients were given dexamethasone along with craniotomy with subdural drain and 30 patients underwent craniotomy with subdural drain. Treatment was given depending on the MGS at admission (table 2).

Treatment outcome was classified according to the MGS at discharge. Favourable results (i.e., Grade 0 + 1 + 2, i.e., without important neurological deficit) were obtained in the great majority of patients treated with Dexamethasone along with craniotomy with subdural drain (66 out of 70 94.28%). 4 (5.72%) patients among this group were readmitted and reoperated for recurrence of hematoma and patients in whom only craniotomy with subdural drain was performed favourable results were obtained in 25 patients out of 30 (83.33%). Among remaining 5 patients 4 (1.33%) were reoperated and 1 patient died after surgery during hospitalization; 76 year old man who presented with depressed level of consciousness and harboured a bilateral chronic SDH with midline shift. In Dexamethasone group only 1 (1 out of 20, 5%) patient deteriorated and was subjected to surgery, other 19 (95%) patient improved. In Patients where treatment was not administered in any form 14 (70%) patients had favourable outcome and 6 (30%) patients were subjected to surgery. Patients from MGS grade 1 and 2 who were treated with dexamethasone have better results as compared to not treated with any modality (95% vs 70%). Patients treated with dexamethasone along with surgery (94.28% had favourable outcome) had better outcome than patient who underwent only surgery (83.33% had favourable outcome). All patients readmitted (6.66%) did well. Mortality was very low for whole series (0.8%) (table 3).

Median hospital stay was 7 days (range 1-41) for the dexamethasone group; 4 days (range 4-28) for the dexamethasone with surgery group and 5 days (range 4-27) for the craniotomy group and 6 days (range 1-41) for the whole series .

Although clinical improvement begun early after dexamethasone initiation, radiological resolution or stabilisation was achieved weeks or months later on during the outpatient follow up period.

It is remarkable that the MGS obtained at the moment of discharge remained stable over time as it was ascertained by reviewing the history notes from the outpatient department, except for those patients who were re admitted in our department due to deterioration attributable to the Haematoma. Median follow up time 25 weeks was allowed.

Table 1: Initial treatment assignment according to Markwalder grading scale.

Grade	No Treatment	Dexamethasone	Dexamethasone with Surgery	Surgery
Grade 0	12	08	0	0
Grade 1	08	12	0	0
Grade 2	0	0	37	5
Grade 3	0	0	28	20
Grade 4	0	0	5	5

Table 2: Outcome measured by the MGS according to treatment modality.

N	Initial treatment assigned	MWS 0		MWS 1		MWS 2		MWS 3		MWS 4		Expired post treatment
		post	pre	post	pre	post	pre	post	pre	post	pre	
20	No Treatment	10	12	4	8	1	0	5	0	0	0	0
20	Dexamethasone	24	8	9	12	0	0	1	0	0	0	0
70	Dexamethasone plus surgery	54	0	7	0	0	37	2	28	2	0	0
30	Surgery	25	0	5	0	2	5	2	20	0	0	1
140		103	20	21	20	3	42	10	48	2	0	1

Table 3: Outcome Measured according to treatment modality

Treatment Modality	Number of patients	Number of patients treated	Number of patients deteriorated and underwent surgery	Number of patients expired
No treatment given	20	14 (70%)	6 (30%)	0
Dexamethasone only	20	19 (95%)	1 (5%)	0
Dexamethasone with surgery	70	66 (94.28%)	4 (5.72%)	0
Surgery only	30	25 (83.33%)	4 (1.33%)	1 (0.33%)

DISCUSSION

Chronic subdural hematoma (CSDH) is one of the most common neurosurgical conditions. The preferred surgical method continues to attract debate. There is lack of uniformity about the treatment strategies, such as the role of burr hole, twist drill, craniotomy, etc., in CSDH amongst various surgeons. There is also disagreement about the use of drain, irrigation, and steroid.

The annual incidence of CSDH is about 1-5.3 cases per 100, 000 population. The incidence is increasing due to increase in aging population, associated medical diseases such as hypertension, diabetes, anticoagulant, and/or antiplatelet therapy. Although the surgical techniques are simple, recurrences remain one of the challenges in the treatment.

The actual “gold standard” of treatment is surgical evacuation, with various techniques used across neurosurgical teams. Over the years, there has been growing evidence that inflammatory processes play a major role in the pathogenesis of CSDH. In that context, the use of corticosteroids has been proposed alone or as an adjuvant treatment to surgery. In our study we have included 120 patients of chronic subdural hematoma and treated according to

Markwalder grading scale. We have used dexamethasone as well as surgical treatment in our patients depending upon Markwalder grading scale and condition of patient. We have divided patients according to Markwalder Grading scale and treatment modalities used were dexamethasone, dexamethasone with surgery and surgery alone.

In our study, Initial treatment assignment was as follows, 20 patients no treatment was administered, 20 patients underline dexamethasone protocol, 70 patients were given dexamethasone along with craniotomy with subdural drain and 30 patients underwent craniotomy with subdural drain. Treatment was given depending on the MGS at admission.

Treatment outcome was classified according to the MGS at discharge. Favourable results (i.e. Grade 0 + 1 + 2, i.e. without important neurological deficit) were obtained in the great majority of patients treated with Dexamethasone along with craniotomy with subdural drain (66 out of 70 94.28%). 4 (5.72%) patients among this group were readmitted and reoperated for recurrence of hematoma. And patients in whom only craniotomy with subdural drain was performed favourable results were obtained in 25 patients out of 30 (83.33%). Among remaining 5 patients 4 (1.33%)

were reoperated and 1 patient died after surgery during hospitalization; 76 year old man who presented with depressed level of consciousness and harboured a bilateral chronic SDH with midline shift. In Dexamethasone group only 1 (1 out of 20, 5%) patient deteriorated and was subjected to surgery, other 19 (95%) patient improved. In Patients where treatment was not administered in any form 14 (70%) patients had favourable outcome and 6 (30%) patients were subjected to surgery. Patients from MGS grade 1 and 2 who were treated with dexamethasone have better results as compared to not treated with any modality (95% vs 70%). Patients treated with dexamethasone along with surgery (94.28% had favourable outcome) had better outcome than patient who underwent only surgery (83.33% had favourable outcome). All patients readmitted (6.66%) did well. Mortality was very low for whole series (0.8%).

Delgado-López PD et al conducted retrospective study of 122 patients dexamethasone treatment in chronic subdural hematoma.¹¹

In their study, initial treatment assignment was as follows: 101 patients underwent the Dexamethasone protocol, 15 patients were operated on by subdural drain, 4 patients underwent craniotomy and 2 patients did not receive any treatment.

Favourable results (MGS grades 0+1+2, that is, without important neurological deficit) were obtained in the great majority of patients treated with dexamethasone (97 out of 101, 96%), subdural drain (14 out of 15, 93.3%) and craniotomy (3 out of 4, 75%). Although clinical improvement begun early after corticoid initiation, radiological resolution or stabilization was achieved weeks or months later on during the outpatient follow up period.¹¹

18 patients were re-admitted to the hospital as a consequence of neurological symptoms attributable to haematomas. One patient died during hospitalization (0.8%). 93 year old woman who presented with drowsiness and generalised weakness and harboured a bilateral CSH with 2 mm midline shift. She was initiated on dexamethasone but failed to improve after 72 hours. She underwent surgery and died the after. Ambrosetto C et al¹² concluded in their study all 3 patients included in study resolved within few months (improved within 2-4 weeks) with a combination of bed rest, vitamin supplement, corticoids, intravenous injection of hypertonic glucose solutions and other drugs. Diagnosis and follow up done with cerebral angiogram.¹²

Bender MB and Christoff N concluded in their study, All 27 patients improved after 24 hours. They used prednisone 60 mg for 21 days average. Diagnosis and follow up done with cerebral angiogram. Ten patients (37%) needed surgery afterwards due to clinical stabilization or deterioration after 72 hours.¹³

Sun TFD et al¹⁴ conducted a study on 26 patients, they gave Dexamethasone 4mg/6h for 21 days. Patients in old age with medical co-morbidity or who refused surgical treatment. 23 patients (84%) achieved favourable outcome. Surgical drain plus steroids reduced the chance of re-accumulation.¹⁴ The limitation of the present study comprised of lack of standardization and patients who couldn't come for follow up.

CONCLUSION

This novel therapeutic approach to Chronic subdural haematoma opposes the traditional view of neurosurgeons that are prone to indicate early surgery supported by good results obtained in thousand of cases before. In early presentation with minimal neurological deficit; glucocorticoids reduced progression of disease and need of surgery. We do not advocate for the substitution of surgery in patients with advanced presentation by steroid medication but to consider a conservative and good supportive treatment to reduce recurrence and progression along with surgery in the majority of cases.

There is a role of medical treatment in a selected group of patients with CSDH. Well-designed, multicenter, randomized controlled trials are required further to define the indications and standard protocols for the medical treatment of CSDH.

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