Organized Subdural Hematoma with Thick Membrane in Chronic Subdural Hematoma

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ABSTRACT

Introduction: Chronic subdural hematoma (CSDH) may occasionally contain organized hematoma which can lead to recurrence and other complications after surgery. There is no exact study and data about OHTMF in Nepal so far. The main objective of this study is to study its prevalence and complications.

Methods: This is a multicentric retrospective analytical study being carried out at Norvic International Hospital and Annapurna Neurological Institute. We retrospectively analyzed one hundred cases of CSDH between early 2006 to 2010 August. We focused our study mainly on OHTMF.

Results: Of 100 cases, majority of the patients were male ranging from 4 to 85 years of age. Bilateral subdural hematoma was found in about 9% of cases. Majority of cases were treated in usual fashion with single burr hole and drain.

OHTMF was found in 3 cases (3%) for which craniotomy with radical membranectomy was performed. In 2 cases membrane formation was noticed during surgery, craniotomy with total membranectomy was performed immediately. In one case there was recurrence of CSDH within 10 days of single burr hole evacuation. Craniotomy with membranectomy was performed in 2nd surgery. There was no recurrence after membranectomy. One case developed seizure post operatively.

Conclusions: OHTMF is one of the important causes of CSDH recurrence. It has to be treated radically. Different hypotheses have been postulated regarding thick membrane formation in CSDH. We have tried to discuss these hypotheses.

Keywords: burr hole evacuation, craniotomy, CSDH, OHTMF

INTRODUCTION

Chronic subdural hematoma (CSDH) is one of the common neurosurgical entities and its surgery is usually rewarding. Many studies about CSDH have been carried out in many centers and basic information about this condition is already well known.¹⁻⁴ Occasionally, it may present in different ways such as empyema formation, calcification, organized hematoma etc.^{5, 6} Organized

hematoma with thick membrane formation (OHTMF) is one of them and has to be treated appropriately. Usual burr hole craniostomy is not sufficient to remove the membrane. If not adequately removed, it can cause early recurrence and will create further complications.^{7, 8} Recurrence rate of CSDH after surgery is about 5% to 25%. OHTMF is one of the major causes of early recurrence. Besides underlying pathology, failure to provide appropriate treatment is another cause of

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recurrence. Thick membrane formation is found in about 5-6% of cases.⁹ Possibility of recurrence of CSDH in case of OHTMF is high because of both underlying pathology and inappropriate surgical treatment.

METHODS

This is a multicentric retrospective analytical study of OHTMF. The study was carried out at Norvic international hospital and Annapurna neurological institute. Incidence of OHTMF in CSDH, its pathophysiology, treatment and outcome have been analyzed and discussed in addition to other facts of CSDH.

One hundred cases of CSDH between early 2006 and 2010 August were randomly selected and analyzed. Demographic analysis of CSDH and OHTMF was done. All the cases were diagnosed by plain computerized tomography (CT scan). Enhanced CT scan or magnetic resonance imaging (MRI) was not performed. This is mainly because CT scan is usually good enough to diagnose CSDH and further investigation is expensive. Moreover, due to lack of experience in organized subdural hematoma, need of MRI or enhanced CT was not realized. Burr hole craniostomy was performed in majority of cases. Drain in the subdural cavity was invariably placed in all the cases and removed after 24 to 72 hours depending on amount of drain collection. Patient was put in head down or flat position to facilitate brain expansion after surgery. Once drain was taken out patient was allowed to sit and then walk. Total admission period was about 3-7 days.

RESULTS

Demographic profiles of the study population are shown in table 1. Majority of patients were male comprising about 90%. Age ranged from 4 to 85 years, the most common age group being 70-79. More than 90% cases had subdural hematoma on only one side where as <10% had hematoma on the both sides. In majority of cases one or two burr holes were made depending on size of hematoma and complete evacuation of hematoma achieved. However, in 3 cases burr hole craniostomy was not adequate to evacuate the whole hematoma due to OHTMF. There were four cases of recurrence out of which one was OHTMF. Remaining 3 were CSDH without OHTMF. There was one case of mortality after surgery. Mortality was a case of 80 years old male patient and died due to underlying respiratory problem.

Table 1.

Demographic profile of the patients

Sex	No	%
male	89	89
female	11	11
total	100	100
Age group		
< 30	6	6
30-39	9	9
40-49	3	3
50-59	19	19
60-69	22	22
70-79	26	26
> 80	15	15
Total	100	100

Three Cases with OHTMF

Of 100 cases only 3 cases had OHTMF (Figure 1).

Figure 1. Pie diagram showing proportion of OHTMF out of total cases of CSDH

All the three cases were male and were between 60 to 85 years of age. None of them had any significant head injury. Plain CT scan of head was the only neuroimaging done which showed loculated type of subdural hematoma (Figure 2).

Figure 2. Plain CT scan of brain of case no. 1 with OHTMF showing heterogenous multiloculated subdural mass in left frontoparietal region suggesting thick membrane formation

In first two cases, no blood was seen through burr hole, rather yellowish solid component was noted which was different from underlying brain tissue. Further exploration was planned and therefore bigger craniotomy was made which exposed huge thick membranous mass containing organized hematoma within it (Figure 3).

Figure 3. Intraoperative picture of case no. 1 with OHTMF. There was thick and huge membrane with two layers with cavity in between as indicated with arrows in picture D.

The whole membrane was removed and subdural space thoroughly irrigated with isotonic fluid. In third case subdural hematoma was evacuated through burr hole craniotomy as in other cases. However patient came back to hospital within 10 days with the features of raised intracranial pressure. Second CT scan of brain showed recurrence of hematoma. Therefore possibility of thick membrane formation was suspected and craniotomy was done. There was OHTMF as suspected with the experience of previous two cases and complete evacuation was achieved.

Post operatively all of them recovered fully except for one case which developed few episodes of focal seizure immediately after surgery. Histopathological evaluation of membrane showed thick membrane with dense connective tissue, chronic inflammatory cells, focal calcifications etc. Repeat CT scan of brain taken after few months of surgery showed no residual or recurrence of CSDH.

DISCUSSION

In general, different aspects of CSDH in our study are similar to other previous studies. Trend of chronic subdural hematoma in terms of age of occurrence in our series is similar to others.^{2, 10} There is a trend of rising number of cases with rising age in our study though the number has fallen down at age >80 years, probably due to less number of total population in this age. We also noticed significant number of cases of CSDH in younger age, about 15% in <40 years of age, probably because of significant number of head injury due to road traffic accident.

Recurrence of hematoma is one of the important facts of CSDH. Our study showed recurrence in 4 % of cases. In literatures, recurrence rate of CSDH has been reported as high as 21 %.^{2, 10} Thick membrane formations is one of the most important factors for recurrence which has been reported as common as 6%.^{6, 9-14} Our study showed thick membrane formation with organized hematoma in 3% of cases.

Histological study of OHTMF usually shows the evidence of membrane formation.¹¹ In our study histopathological evaluation showed thick membrane with dense connective tissue, chronic inflammatory cells, focal calcifications etc. According to literature, the membrane consists of a capsule with inner and outer layers which contain different tissues like fibroblasts, muscle, dural tissues, granulation tissues and also different vascular structures like capillaries, venules and arterioles. With ongoing chronic inflammatory process these tissues undergo fibrous changes, get organized and lead to thick membrane formation.^{15, 16} One study showed that the subdural hematoma is actually an "intra" dural hematoma which is formed within the split dural border cell layer. They have explained the origin of membrane in CSDH with the help of electronic microscope that the dura mater with rich vascular supply forms thick granulation tissue, that is outer subdural neomembrane (SN) and a few dural border cells on the underlying arachnoid membrane form thin fibrous inner SN.¹⁷ In our cases also, there were two layers of the thick membrane within which there was hematoma. Another study with electron microscopy of the dural side of the outer membrane showed the collagen fibers were woven into a compact framework with a dense arrangement. The fiber bundles had a honeycomb structure framed by the collagen fibers. Observation of the hematoma side found the collagen bundles had a sparse wavy appearance. The arrangement of the collagen fibers on the dural side is different from that on the hematoma side. The thick outer membrane may be formed by granulation resulting from inflammatory

reaction. Collagen fibrillary networks are not fragile, and may reinforce the outer membrane of the recurrent hematoma.

In fact, thin membrane is a part of usual CSDH. While evacuating the hematoma, the membrane is opened along with dura mater. Once the hematoma is evacuated completely the membrane gets degenerated. However, in long standing cases, the same membrane becomes thicker due to on going inflammatory process as explained above. This thick membrane and overlying dura is much more vascular which is supposed to be one of the causes of subdural recollection.⁷

Thick membrane formation is an uncommon complication of CSDH. Preoperatively, thick membrane or septum formation can be suspected by loculated appearance, double or multiple.¹⁴ It can also be suspected by noticing thick membrane in previous surgery of a case which has recurred.⁷ Contrast enhanced CT or MRI of brain greatly improves the possibility of detecting thick membrane with hematoma.⁹

In all of our cases membrane formation was not identified preoperatively as only plain CT of brain was obtained due to financial reason. In first two cases membrane formation was identified during surgery. Thus burr hole craniostomy was converted into bigger craniotomy. Second case was operated about 1.5 years latter than the first one. In case of second case we were more convinced about membrane formation, from experience of first case, and surgery was planned accordingly. The whole hematoma along with thick membrane was then removed. In third case there was recurrence of

hematoma within 10 days of first burr hole evacuation of CSDH. Repeat CT scan of brain showed recurrence of subdural hematoma with doubtful membrane formation. Thus craniotomy was planned and membrane taken out. Regarding the treatment of OHTMF, there is no other way but removing the whole of membrane. Many studies have shown that eventually craniotomy and total membranectomy was done after recurrence of CSDH after burr hole craniostomy. Organized subdural hematoma with thick membrane, until and unless removed radically, can lead to recurrence sooner or later.^{7, 12, 13} In our cases also, as we noticed hematoma with thick membrane, and thus craniotomy with radical membranectomy was performed.

One report has mentioned that obliteration of the subdural space by attaching dura to the inner membrane with fibrin glue is also helpful.⁸ Few reports suggested durectomy as well in addition to membranectomy.¹² However, we didn't do durectomy and our case showed no recurrence with membranectomy alone.

CONCLUSIONS

In every case of CSDH, possibility of thick membrane formation should be considered. Even plain CT scan can sometimes give the hints about possible thick membrane formation as in our cases. However, enhanced CT scan and MRI would be helpful in suspicious cases. Craniotomy and radical membranectomy is the procedure of choice in case of OHTMF.

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