ROLE OF BURR HOLE AND CRANIOTOMY IN THE EVACUATION OF CHRONIC SUBDURAL HAEMATOMA AND OUTCOME

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ABSTRACT

BACKGROUND

Chronic Subdural Haematomas (CSDH) is a frequently encountered condition in neurosurgical practice with increasing incidence because of ageing population particularly in those who use anticoagulants and antiplatelet agents. These are treated with evacuation of CSDH with burr holes, craniotomy and craniotomy after burr holes for recurrence or reaccumulation in few. The surgical procedure, need for additional surgical procedure, complications and outcome are assessed.

MATERIALS AND METHODS

During the period of 4 years 6 months from September 2012 to March 2017, 225 patients who presented with chronic subdural haematoma were treated. This is a retrospective study. These patients underwent non-contrast CT at the time of admission. Surgical evacuation of CSDH was done and patient outcome in terms of reaccumulation, recurrence, complications and final outcome are observed.

RESULTS

Out of total 225 cases, 183 are males and 42 are females, 81.33% and 18.66%, respectively. 167 cases are treated with burr-hole evacuation and 58 with craniotomy, 74.22% and 25.77%, respectively. 35 out of 167 patients treated with burr holes needed re-exploration of previous burr holes and evacuation in 24 cases and conversion to craniotomy in 11 cases. 6 out of 58 patients treated with craniotomy needed exploration for reaccumulation of SDH. The death rate is 6.7% (11 patients) in burr-hole cases and 10.3% (6 cases) in craniotomy cases.

CONCLUSION

Management of CSDH either with burr holes or craniotomy should be selected on case-by-case basis depending on radiographic findings like membrane thickness associated acute haemorrhage, multiple loculations, calcified membrane, underlying intracranial complications and general condition of the patient.

KEYWORDS

Chronic Subdural Haematoma, Burr Hole, Frontotemporoparietal Craniotomy.

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BACKGROUND

Chronic Subdural Haematoma (CSDH), a common neurosurgical disease, is now steadily increasing in the incidence in modern neurosurgical practices because of the aging population. This rise in incidence among aged individuals is due to increased use of anticoagulant and antiplatelet agents in cardiovascular and cerebrovascular diseases.[1] In significant number of cases, the history of trivial trauma, some hereditary bleeding diatheses, epilepsy, alcohol abuse are aetiological factors. Anticoagulation increases the risk of CSDH by more than 40-fold relative to the general population.[2] The propensity for CSDH formation in the elderly can be explained by the shrinking brain volume within the confines of the cranial vault. As this occurs, tension on the bridging parasagittal veins that drain the cortical surface predisposes them to injury and haemorrhage at the dura-arachnoid interface. Transformation of acute bleeding to chronic bleeding follows a series of pathologic processes in which there is fibrin deposition followed by subsequent organisation, enzymatic fibrinolysis and clot liquefaction.[3] In many cases, this process is sufficient to achieve complete resorption of the haematoma. However, in other instances, a chronic inflammatory reaction is set in motion, entailing dural border cell proliferation, collagen synthesis and neomembrane formation with neovascularisation. The latter is a seminal event in the formation of CSDHs, and this ingrowth of fragile capillaries

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into the neomembranes underlies their propensity for microhaemorrhage with cyclical recurrence. Some even propose that antithrombotic and fibrinolytic substances are secreted by the neomembrane into the haematoma cavity, enabling persistence and gradual enlargement overtime.[4,5]

It is diagnosed on non-contrast CT (computed tomography) scans in most of the cases and in few contrast enhanced CT scan where there is suspicion of thick membrane with multiple loculations. The reported incidence is approximately 3 per 1,00,000 and rises appreciably in the elderly population.[6] Though, there is a consensus that surgical drainage is the preferred treatment for symptomatic patients, the ideal surgical approach remains controversial between burr-hole evacuation and craniotomy.[7] After evacuation of CSDH, the outcome of patients ranges from immediate complete recovery to significant morbidity and mortality.

The process of creating window in the skull for intracranial condition can be dated as far back as the Neolithic era (8000-5000 B.C.).[8] The earliest description is documented in the Hippocratic treatise, in which for the first time a systematic account is provided complete with indications, timing and technical notes. The advent of antisepsis, improved anaesthesia and imaging technique, the craniotomy became cemented into modernity.[9]

The purpose of the study is to make out the decision making policy adopted in treating patients with CSDH on an individual basis after consideration of the patient's clinical status, comorbidities, and radiologic appearance of the haematoma. This is between conservative or surgical management, burr-hole evacuation or craniotomy, to keep drain or not, treatment for recurrence and management in patients on anticoagulants. Finally, the outcome of the patients.

MATERIALS AND METHODS

During the period of September, 2012, to March, 2017, 225 patients were admitted with CSDH in King George Hospital, Andhra Medical College, Visakhapatnam, were investigated with non-enhanced CT and in few contrast-enhanced CT scan, where there is suspicion of thick membrane with multiple loculations. This is a retrospective study. Out of 225 cases, 183 are males and 42 are females, 81.33% and 18.66%, respectively. Patients with minimal CSDH that can be managed conservatively, underlying vascular abnormalities, bleeding disorders like active leukaemia or associated other intracranial pathology are excluded from the present study. Symptoms most commonly include headache, nausea, emesis, drowsiness, vertigo, mental deterioration, gait instability, limb paresis, sphincter disturbances and seizures. History of a trivial trauma and alcohol abuse was present in few cases.

167 cases are treated with burr-hole evacuation and 58 with craniotomy where patients presented with complex radiological findings on CT, thick membrane, calcification, acute haematoma and multiple loculations amounting to 74.22% and 25.77%, respectively. Out of 167 cases treated with burr hole, 139 are treated with two burr holes frontal and parietal region and rest are treated with three burr holes on Frontotemporoparietal (FTP) region. In 27 cases, CSDH was bilateral and evacuation was done on both the sides. The burr holes are made some distance apart to facilitate saline irrigation between them. The dura is then opened and the leaflets bipolared to the edge of the craniotomy to ensure that the subdural space remains in communication with the cranial opening. Any subdural collection is then irrigated in a reciprocating fashion until the effluent becomes clear.

Frontotemporoparietal Craniotomy (FTPC) of variable sizes, minimum being 5-7 cm centred over the area of maximal haematoma thickness was done in 58 cases. Patients with associated acute haemorrhage, thick membrane, calcified membrane and presence of multiple loculations are subjected for FTPC. In 5 patients, it was bilateral and other side of CSDH needed burr-hole craniotomy. In vast majority of cases, 141 of 167 of Burr-Hole Craniotomy (BHC) cases and 51 of 58 of craniotomy cases, subgaleal drain was kept. Because subdural drain insertion carries a risk of cortical injury, epilepsy and infection, subgaleal or subperiosteal drainage has been proposed as a less invasive and we followed this in present study. This closed drain system was kept for a period of 48 hours to 72 hours.

18 patients of BHC and 4 patients of FTPC who were on antiplatelet agents with positive platelet function assay were given two units of platelets just before surgery. Antibiotic prophylaxis was given during surgical procedure and postoperatively and Antiepileptic Drugs (AED) were given as prophylaxis.

RESULTS

The present study over a period of four and half years consists of total 225 cases, out of which, 183 are males and 42 are females ages ranging from 44 to 83 years in males and 39 to 85 years in females. 167 cases are treated with burr-hole evacuation and 58 with craniotomy were analysed in terms of reaccumulation of haematoma, recurrence, complications and outcome.

There was history of remote trauma in 94 patients treated with BHC and 34 patients with FTPC. 18 patients of BHC and 4 patients of FTPC who were on antiplatelet agents with positive platelet function assay were given two units of platelets just before surgery. History of alcohol abuse was seen in 41 patients of BHC and 19 patients of FTPC. The locations CSDH was right side in 107 cases, left side in 86 cases and bilateral in 32 cases. The average thickness of haematoma in initial CT was 17.9 mm in BHC cases and 23.3 mm in FTPC cases. Clot volume of subdural haematoma was measured using the formula AxBxC/2, where A, B and C represent the dimensions in three axes perpendicular to each other.[10] A total of 35 cases of initial BHC needed re-evacuation of symptomatic residual CSDH or acute haemorrhage caused by original surgery. Out of these 35, 24 patients needed reopening and irrigation of original burr holes and 11 patients needed conversion into FTPC for complete evacuation. Out of 58 patients who underwent

initial FTPC, 6 needed re-exploration and evacuation of residual/recurrent Subdural Haematoma (SDH). In 32 cases with bilateral CSDH, 27 patients treated with bilateral burr holes and 5 patients treated with FTPC on one side and burr holes on the other side (treatment adopted policy is shown in Figure 1). Subgaleal drain was kept in 141 out of 167 cases treated with BHC and 51 out of 58 cases treated with FTPC for a period of 48 to 72 hours. The postoperative complications are seizures in 7 patients, stroke in 8, acute intracranial haemorrhage in 11, deep vein thrombosis/pulmonary embolism in 3, pneumonia in 13, respiratory failure in 5, cellulitis at decubitus ulcers in 11 cases, myocardial infarction in 3, new-onset arrhythmia in 3 and urinary tract infection in 18 patients.

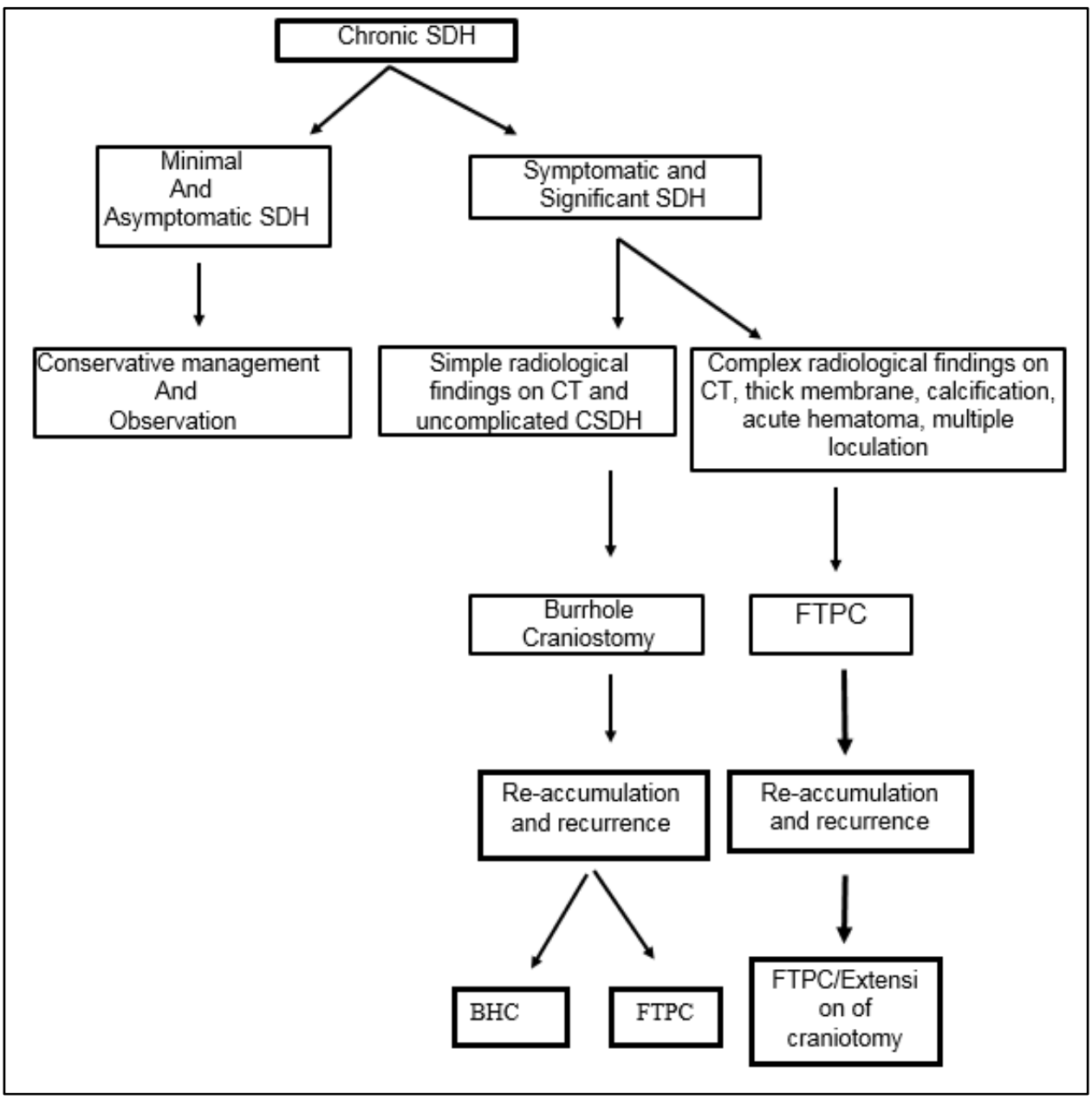

Figure 1. Approach Adopted in Treating Patients with Chronic Subdural Haematoma

125 patients treated with BHC and 33 patients treated with FTPC are discharged with good general condition. 31 patients treated with BHC and 19 patients treated with FTPC required skilled nursing and rehabilitation treatment. 11 patients treated with BHC and 6 patients treated with FTPC expired during hospital stay.

DISCUSSION

Chronic subdural haematoma is one of the most common neurosurgical condition that is encountered. The surgical treatments adopted were burr-hole drainage and craniotomy. Twist-drill craniotomy and endoscopic evacuation were not done in our present study. 35 patients, i.e. 20.9% of the patients who underwent BHC needed second surgical procedure for recurrence. In 14.32%, evacuation through previous burr holes was done, and in 6.58% cases, FTPC was done to evacuate acute haematoma following initial surgery. 6 patients, i.e. 10.34% of initial FTP craniotomy presented with recurrence and are treated with exploration of same craniotomy in 5 cases and with extension of craniotomy in one case.

Mondorf et al describes a comparison between craniotomy and burr-hole treatments.

Where the number of craniotomy patients more than triples that of the burr-hole group.[11] Sambasivan compares 2,300 cases of CSDH, where over 2,200 are treated with craniotomy and only 51 with burr-hole drainage.[12] Lee et al compares 38 patients with burr-hole drainage to 13 treated with craniotomy.[13] The difference in surgical treatment numbers correlates to skewed results and uncertain interpretation thus making the choice of optimal surgical treatment more difficult to ascertain.

125 patients, i.e. 74.8% out of 167 treated with BHC were discharged with fair general condition. 31 patients, i.e. 18.56% out of 167 required skilled nursing and rehabilitation treatment in the postoperative period. 11 patients, i.e. 6.5% out of 167 expired during hospital stay because of medical complications.

33 patients, i.e. 56.89% out of 167 treated with FTPC were discharged with fair general condition. 19 patients, i.e. 32.7 out of 167 required skilled nursing and rehabilitation treatment in the postoperative period. 6 patients, i.e. 10.3% out of 167 expired during hospital stay because of medical complications and intracranial complications. The outcome in patients treated with BHC was good as compared to patients treated with FTPC might be because of simple radiological findings on CT without any intracranial complications.

Drains were employed in the subgaleal region in 141 cases of 167 treated with BHC and 51 of 58 treated with FTPC to reduce the risk of haematoma recurrence and thus reoperation. Data from Weigal et al supports the use of closed system drainage in reducing the risk of haematoma recurrence[14] and thus the need for reoperation. Santarius et al randomised 215 patients with CSDH treated with burr-hole washout into two groups- drain vs. no drain. Those with drain were found to have a lower reoperation rate due to decreased recurrence of the haematoma.[15] Mori and Maeda reported a reoperation rate of 9.8% in 500 patients with burr-hole craniotomy with closed system drainage.[16] Mondorf et al reported 14.3% reoperation in 42 patients.[11] Similarly, in this study, 95% of the patients treated with burr-hole washout and 67% of the craniotomy group underwent closed system drainage postoperatively. Subdural drain initially kept in two cases of FTPC, both had complication like postoperative seizures in one patient and reaccumulation in another. In rest of the cases, no subdural drain was kept.

Limitations of our study are primarily related to the retrospective nature and the relatively small number of patients. This is a retrospective study. There is a lack of long-term follow-up in our study. As it may be difficult to generalise the conclusions from the smaller sample size, the difference in patient safety and cost require further investigation. Future long-term multi-institutional, prospective studies are needed to fully demarcate the differential outcomes due to procedure choice.

CONCLUSION

The results of burr-hole evacuation appears to be superior to craniotomy for the treatment of CSDH with respect to patient outcome, reoperative rates and length of hospital stay. But, it appears to be because of absence of complex nature of CSDH and thus less incidence of intracranial complications. But, the conclusion is management of CSDH either with burr holes or craniotomy should be selected on case-by-case basis depending on radiographic findings like membrane thickness, associated acute haemorrhage, multiple loculations, calcified membrane, underlying intracranial complications and general condition of the patient.

Abbreviations- AED= Antiepileptic drugs; BHC = Burr-hole craniotomy; CSDH = Chronic subdural haematoma; CT = Computed tomography; FTP = Frontotemporoparietal; FTPC = Frontotemporoparietal craniotomy.

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