Minimally Invasive Approaches for Chronic Subdural Hematoma: The Experience of a Education Clinic in Eastern Anatolia

Kronik Subdural Hematomların Yönetiminde Minimal İnvaziv Yaklaşımlar: Doğu Anadolu'nun Bir Eğitim Kliniğindeki Deneyimler

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ABSTRACT Objective: Chronic subdural hematomas typically appear in the elderly and they are the most frequent diseases that make elderly people admit to neurosurgeons. This disease usually requires a neurosurgical operation when symptomatic, and a number of interventions ranging from needle aspiration to draining of hematoma by craniotomy have been described. In this article, we present our interventions for subdural hematomas, and the patients we treated by minimally invasive methods in Elazığ Training and Research Hospital, as a peripheral education clinic. **Material and Methods:** Patients were basically divided into three groups. In the first group, there were patients who had a burr hole drainage under general anesthesia. In the second group, there were patients who had a mini-craniotomy under general anesthesia. In the third group, there were patients who had burr hole drainage under local anesthesia. The patients were assessed for their age, gender, complaints at presentation, systemic problems, trauma history, use of anticoagulants, radiological features, preferred surgical intervention, type of anesthesia, mortality and morbidity. **Results:** When mortality and morbidity rates were considered, none of the patients had operative morbidity. One patient from the first group and one patient from the second group died in the intensive care unit due to their systemic problems. No surgery-related mortality was seen. One patient in the first group needed revision surgery and one patient in the third group needed two revision surgeries. **Conclusion:** Initial results of our study indicate that minimally invasive surgical methods are effective and safe for the treatment of chronic subdural hematoma. Prospective randomized trials are needed for more precise results.

Key Words: Hematoma, subdural, chronic; surgical procedures, minimally invasive; craniotomy

ÖZET Amaç: Kronik subdural hematom sıklıkla yaşlı popülasyonda görülen ve bu yaş grubunu nöroşirürjyenlerle en sık karşılaştıran hastalıktır. Semptomatik olduğunda çoğunlukla nöroşirürjikal operasyon gerektiren bu hastalık grubunda, iğne aspirasyonundan, hematomun kraniyotomi ile boşaltılmasına kadar çeşitli girişimler tariflenmiştir. Bu yazımızda bir perifer eğitim kliniği olarak Elazığ Eğitim Araştırma Hastanesindeki subdural hematomlarla ilgili girişimlerimizi ve minimal invaziv metotlarla tedavi ettiğimiz hastaları sunmak istedik. **Gereç ve Yöntemler:** Hastalar temel olarak üç gruba bölündü. İlk grupta genel anestezi eşliğinde burr hole drenajı uygulanan hastalar, ikinci grupta genel anestezi eşliğinde mini-kraniyotomi uygulanan hastalar, üçüncü grupta ise lokal anestezi eşliğinde burr hole drenajı uygulanan hastalar vardı. Hastalar yaşları, cinsiyetleri, başvuru şikâyetleri, sistemik sorunları, travma hikâyeleri, antikoagülan kullanımları, radyolojik özellikleri, tercih edilen cerrahi girişim, anestezi türü, mortalite ve morbidite açısından değerlendirildi. **Bulgular:** Mortalite morbidite oranlarına bakıldığında hiçbir grupta operatif morbidite saptanmadı, ancak birinci ve ikinci gruptan birer hasta postoperatif dönemde yoğun bakımda sistemik sorunları nedeniyle kaybedildi. Operasyona bağlı mortalite saptanmadı. Revizyon cerrahi oranlarına bakıldığında; ilk gruptan bir hastaya bir kez, üçüncü gruptan bir hastaya iki kez revizyon cerrahisi uygulandığı görüldü. **Sonuç:** Çalışmamızın erken sonuçları, kronik subdural hematom cerrahisinde minimal invaziv yöntemlerin etkin ve güvenilir olduğunu göstermiştir. Daha kesin sonuçlar için prospektif, randomize çalışmalar gerekmektedir.

Anahtar Kelimeler: Hematom, subdural, kronik; cerrahi işlemler, minimal girişimsel; kranyotomi

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Chronic subdural hematomas (CSDH) typically appear in the elderly and they are the most frequent diseases that make elderly people admit to neurosurgeons. The incidence of the disease is approximately 1-58/100 000, and the disease is most frequently seen in 70-80-year-old individuals.[1-3] Cortical atrophy and enlargement of potential subdural space increase subdural venous tension and create susceptibility to bleeding after trauma in elderly. Enlargement of subdural space also facilitates formation of membranes formed by blood degradation components after bleeding.[1] Subdural hygromas are similarly prone to bleeding, and they are among the etiological factors of CSDH.[1,4]

This disease usually requires a neurosurgical operation when symptomatic, and a number of interventions ranging from needle aspiration to draining of hematoma by craniotomy have been described. However, when the systemic diseases are considered in elderly, it is important to choose the proper intervention and minimize the comorbidity related to operation. At this point, importance of minimally invasive methods to drain the hematoma are emphasized.[5] In this article, we present our interventions related to subdural hematomas and the patients we treated by minimally invasive methods in Elazığ Training and Research Hospital, as a peripheral education clinic.

MATERIAL AND METHODS

The patients who were admitted or referred to Elazığ Training and Research Hospital with CSDH between 2008 and 2012 were retrospectively analyzed. The data of 30 operated patients were evaluated using the patient files, radiological and operating room records and the data obtained from the telephone interviews.

On preoperative cranial computerized tomography (CCT) or magnetic resonance imaging (CMRI), we looked for membrane formation in subdural space, and evaluated its severity as severe, moderate or mild.

Patients were divided into three groups: In the first group, there were patients who had a burr hole drainage under general anesthesia. In the second group, there were patients who had a mini-craniotomy under general anesthesia. In the third group, there were patients who had a burr hole drainage under local anesthesia. The patients were assessed according to their age, gender, complaints at presentation, systemic problems, trauma history, use of anticoagulants, radiological features, preferredsurgical intervention, type of anesthesia, mortality and morbidity.

RESULTS

Among 30 patients, 16 had a burr hole drainage under general anesthesia, 4 had a mini-craniotomy under general anesthesia, and 10 had a burr hole drainage under local anesthesia. Median ages of these patients were found as 72, 74.5 and 77 years, respectively. The males consisted of 68%, 75% and 80% of the groups, respectively. When the complaints were considered, headache and the history of weakness were seen in 93% of the patients who had a burr hole drainage under general or local anesthesia. In patients who had a mini-craniotomy, the most frequent symptom was altered consciousness and was seen in 50 % of the patients. There was a trauma history in 93% and anticoagulant-antiaggregant use in 18% of the patients in the first group; these ratios were 75% and 0% and 90% and 30% in the second and third groups, respectively.

When the systemic diseases were taken into account, in the first group 7 patients (43%) had hypertension (HT) and/or diabetes mellitus (DM), in the second group one patient (25%) had HT and chronic myeloid lymphoma, and in the third group eight patients had HT and/or DM and 1 patient had chronic renal failure (90%).

On radiological imaging, 56% (N:9) of the patients had mild and 44% (N:7) of them had moderate membrane formation in the first group. In mini-craniotomy group, all (N:4) patients had severe subdural membrane formations. In the third group, 60% (N:6) of the patients had mild, and 40% (N:4) of them had moderate membrane formations.

When mortality and morbidity rates are considered, none of the patients had surgery-related

morbidity, but two patients died in the intensive care unit due to their systemic problems.

One patient in the first group needed one, and one patient in the third group needed two revision surgeries (Table 1).

DISCUSSION

CSDH is a frequently encountered disease in neurosurgery practice and can be treated by simple surgical interventions. However, when it is considered that most of the patients are old and have many systemic problems, the importance of surgical management is understood. The co-morbidities in the elderly population include increased anticoagulant use, and this condition increases peroperative bleeding, and consequently, mortality and morbidity.[5]

Several surgical methods have been described for an intervention to the subdural space. Frequently used methods are burr-hole trepanation and craniotomy. Lately, twist drill craniostomy has been defined, but it is not frequently used as it is expensive, the related knowledge is not sufficient, and the first studies showed high recurrence rates (33%).[1,2,6]Although burr-hole craniostomy has been shown as a safe treatment method, reported relapse rates are between 9.2% and 26.5%.[7,8] For craniotomy, postoperative mortality rates mount to 11%, and morbidity rates mount to 25%.[5] In a study in which 48 studies were reviewed, the mean mortality rate of craniotomy was reported as 4.6%, the mean morbidity rate as 12.3%, and mean relapse rate as 10.8%.[9] In the same study, the mean mortality of burr-hole drainage was stated as 2.7%, the mean morbidity as 3.8%, and the mean recur-

TABLE 1: The distribution of the patients in the groups.

Anesthesia	**General anesthesia**	**General anesthesia**	**Regional anesthesia**
Approach	Burr-hole drainage	Mini-craniotomy	Burr- hole drainage
No of patients	16	4	10
Age	min:25-max:88, median: 72 (years)	min:74-max:82 median: 74.5 (years)	min:70-max:88 median: 77 (years)
Gender	11 males, 5 females	3 males, 1 females	8 males, 2 females
Symptoms			
	Headache n=7(43%)	Alteration of consciousness: n=2 (50%)	Headache: n=3 (30%)
	Paresis: n=4 (25%)	Headache: n=1 (%25)	Paresis: n=4 (40%)
	Headache + Paresis: n=4 (25%)	Dysphasia: n=1 (25%)	Headache+paresis: n=1(10%)
	Vertigo: n=1(6%)		Dysphasia+paresis: n=2 (20%)
History of trauma	n=15 (95%)	n=3 (75%)	n=9 (90%)
Anticoagulant-antiaggregant use	n=3 (18%)	n=0 (0%)	n=3 (30%)
Systemic diseases	HT: n=3, DM: n=4	HT+Lymphoma: n=1	HT: n=5, DM: n=3,
	HT+DM: n=2 56%	25%	CRF: n=1 90%
Radiology			
Mild membrane	n=9, 56%	n=0, 0%	n=6, 60%
Moderate membrane	n=7, 44%	n=0, 0%	n=4, 40%
Severe membrane	n=0, 0%	n=4, 100%	n=0, 0%
Bilateral	n=3	n=0	n=1
Surgery	16 patients: 2 burr-hole	4 patients: mini-craniotomy	9 patients: 2 burr-hole
			1 patient: 1 burr-hole
Mortality	n=1 (HT)	n=1 (Lymphoma)	n=0
Morbidity	n=0	n=0	n=0
Revision	n=1 (1 revision)	n=0	n=1 (2 revisions)
	Bilateral subdural hematoma		Bilateral subdural hematoma

Min: Minimum; max: Maximum; HT: Hypertension, DM: Diabetes mellitus; CRF: Chronic renal failure.

rence as 12.1%. This knowledge led the clinicians think about which method to use. In a study on 120 neurosurgeons working in Canada, it was stated that most of the surgeons preferred burr-hole drainage in the first line treatment of subdural hematomas, and burr-hole drainage and craniotomy in the second line treatment.[2] Weigel et al. suggested to use craniotomy at recurrent cases because of its high mortality and morbidity rates when compared to the other methods.[9]

Lately, another popular issue is to perform burr-hole drainage under local anesthesia to minimize anesthesia complications in case of systemic problems. In the study of Liu et al., 368 patients who had a burr-hole drainage under local anesthesia, and 30 patients who had a burr-hole drainage under general anesthesia were assessed, and trepanation under local anesthesia was indicated as a safe method.[10] Guzel et al., in their report of 20 cases, reported that trepanation under continuous sedation and local anesthesia was a safe method.[11]

In a study comparing mini-craniotomy and large craniotomy in CSDH cases, both methods were shown to be effective, but relapse rate was stated to be smaller in the large craniotomy group.[12]

In our study, three different intervention methods were preferred to decrease the mortality and morbidity related to operation: burr-hole drainage under general anesthesia, mini-craniotomy under general anesthesia, and burr-hole drainage under local anesthesia. The burr-hole drainage under general anesthesia was preferred for the patients who had less severe membranes radiologically, and who did not have multisystemic comorbidities. The burr-hole drainage under local anesthesia was preferred for the patients with similar radiological features but serious co-morbidities. The mini-craniotomy under general anesthesia was used when severe and multi-layered membrane formation was seen on radiological imaging. In our series which we present our experience on 30 cases, morbidity related to operation was not seen in any of the groups. However, in burr-hole group under general anesthesia, one mortality was seen due to a hypertensive attack in the postoperative period. In mini-craniotomy group, one patient died because of lymphoma in the late postoperative period. There were not any mortalities in the local anesthesia group.

As stated before, craniotomy should be reserved for recurrent cases in surgical management of CSDH. In our series, the authors suggested and performed re-exploration with burr-hole in recurrent cases. Although this is own experience of the authors, the efficiency of mini-craniotomy primarily applied to the most intense part of membrane formation is also promising. General anesthesia was preferred for mini-craniotomy cases. The reason was the probability of insufficiency of local anesthesia if the procedure took a long time. None of our patients required extensive craniotomy. However, as our series increase in number, extensive craniotomy will probably be needed.

Although the number of the cases is small, the preliminary results of our study indicate that minimally invasive methods are effective and safe in CSDH surgery. This study is also important to reflect the modern management philosophy of CSDH in a peripheral education clinic of Eastern Anatolia. Prospective randomized trials are needed for more precise results.

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