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Original Investigation

Efficacy Analysis of 33 Cases with Epidural Hematoma Treated by Brain Puncture Under CT Surveillance

BT Monitörizasyonu Altında Beyin Ponksiyonuyla Tedavi Edilmiş 33 Epidural Hematom Olgusunun Etkinlik Analizi

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ABSTRACT

AIM: To study the clinical value and efficacy of computerized tomography (CT)-monitored microinvasive craniopuncture for traumatic epidural hematoma.

MATERIAL and METHODS: Thirty-three cases of traumatic epidural hematoma patients were selected at our hospital. YL-1-type disposable intracranial hematoma smash needle puncture and drainage of hematoma were used under CT monitoring and urokinase was used for intermittent flushing, and the residual blood clot was then drained. The improvement rate, cure rate, precision and accuracy of the puncture, incidence of bleeding, puncture infection rate, average length of stay, clinical efficacy, and long-term follow-up were evaluated.

RESULTS: The improvement rate was 100%, the cure rate was 100% accurate, the precise puncture rate was 100%, the re-bleeding rate was 0%, the local infection rate was 0%, the average length of stay was 7.5 days, and the average medical cost was two thousand U.S. dollars.

CONCLUSION: Under CT surveillance, the YL-1-type disposable intracranial hematoma smash puncture needle aspiration in the treatment of traumatic epidural hematoma is a simple, fast, and accurate positioning procedure. Without craniotomy and blood transfusion, the YL-1-type disposable intracranial hematoma smash puncture needle aspiration is a safe and effective operation, but close attention is needed during the operation.

KEYWORDS: Traumatic epidural hematoma, Puncture, Computerized tomography (CT)

ÖZ

AMAÇ: Travmatik epidural hematom için bilgisayarlı tomografi (BT) monitörizasyonu altında mikroinvaziv kranyoponksiyonun klinik değeri ve etkinliğini çalışmak.

YÖNTEM ve GEREÇLER: Hastanemizde 33 travmatik epidural hematom olgusu seçildi. BT monitörizasyon altında YL-1-tipi tek kullanımlık intrakranyal hematom iğne ponksiyonu ve hematom drenajı yapıldı, aralıklı yıkama için ürokinaz kullanıldı ve kalan kan pıhtısı sonra boşaltıldı. Düzelme oranı, tam iyileşme oranı, ponksiyonun kesinlik ve doğruluğu, kanama insidansı, ponksiyon enfeksiyon oranı, ortalama hastanede kalma süresi, klinik etkinlik ve uzun dönemli takip değerlendirildi.

BULGULAR: Düzelme oranı %100, tam iyileşme oranı %100, kesin ponksiyon oranı %100, tekrar kanama oranı %0 ve lokal enfeksiyon oranı %0 bulundu; ortalama hastanede kalma süresi 7,5 gündü ve ortalama tıbbi maliyet 2000 A.B.D. dolarıydı.

SONUÇ: BT monitörizasyonu altında YL-1-tipi tek kullanımlık intrakranyal hematom ponksiyon iğnesi aspirasyonu travmatik epidural hematom tedavisinde basit, hızlı ve doğru bir konumlandırma işlemidir. Kranyotomi ve kan transfüzyonu yapılmadan YL-1-tipi tek kullanımlık intrakranyal hematom ponksiyon iğnesi aspirasyonu güvenli ve etkili bir ameliyattır ve ameliyat sırasında çok dikkatli olunması gerekir.

ANAHTAR SÖZCÜKLER: Travmatik epidural hematom, Ponksiyon, Bilgisayarlı tomografi (BT)

INTRODUCTION

Traumatic epidural hematoma (TEDH) is a common disorder requiring neurosurgical intervention. When epidural hematoma reaches a certain volume, it can cause significantly increased intracranial pressure. Without timely processing, TEDH patients may suffer coma or brain herniation, or even die. Craniotomy, clearing the hematoma, and cranial decompression are effective ways of treating acute epidural hematoma (9). The intracranial puncture technique can be used in the treatment of TEDH under computerized tomography (CT) surveillance. The clinical findings in the current study can be analyzed and summarized as follows.

DATA and METHODS

General Data

Thirty-three cases of traumatic epidural hematoma patients were selected from January 2006 to January 2011 (20 males and 13 females, aged 13 to 76; average age 33.6 years old). The 33 cases were all from the Fourth Affiliated Hospital of China Medical University and several other hospitals around Shenyang. This study was conducted in accordance with the declaration of Helsinki. This study was conducted with approval from the Ethics Committee of the Fourth Affiliated Hospital of China Medical University. Written informed consent was obtained from all participants. The patients were classified by the different sites of hematoma as follows: 18 cases in the frontal, 9 cases in the temporal, 5 cases in the occipital, and 1 case on top. The patients were also classified by the state of consciousness as follows: 23 cases had *Glasgow Coma Scale (*GCS) scores of 7 to 9 points, 6 cases had 10 to 12 points, and 4 cases had 13 to 15 points. Furthermore, the patients were classified by processing time as follows: three cases within 24 h, 23 cases within 24 h to 48 h, 7 cases of more than 48 h (including two cases of 5 d to 6 d after injury). hematoma volume of 30 ml to 40 ml as calculated by the formula (L × W × H) 1 / 2 (3).

Puncture Indication

The following were used as puncture indications: (1) clear history of trauma, (2) single epidural hematoma, as confirmed by CT, (3) presence of supratentorial epidural hematoma, (3) hematoma volume less than 40 ml, (4) presence of the normal clotting mechanism, (5) GCS score of consciousness state more than or equal to 7 points, (6) age was not a contraindication, and (7) complex trauma cases were excluded.

Puncture Methods

(1) Preparation: Ipsilateral scalp 10 × 10 cm in dimension corresponding to the position of the patient was prepared. The patients was not required to shave his hair or avoid drinking water before the forehead puncture. The disposal trolley was filled with sterile materials of body parts, such as 2% lidocaine 5 ml support, 2 to 4 ECG electrodes, power drill, and 1 to 2 pieces YL-1-type of intracranial hematoma smash disposable needle (2.0 cm to 3.0 cm), 20 ml syringe, sterile gloves, masks and hats, and reserve items. The trolley was then moved to the CT room. (2) Location: The patient was made to lie on his spine on the CT examination bed facing upward. His top or occipital hematoma may be in the prone position while lying on the CT examination bed. Up to 4 points were marked using a marker pen signaled roughly on the corresponding parts of the head of the patient. The ECG electrode was then stuck on the corresponding points as a marker. The head of the patient was examined by conventional CT scanning as follows: The piece (Topogram) was positioned, and then layer by layer cross-section scanning was conducted. The surface position, angle, and predicted target depth of the puncture needle were selected according to the relationship between the computer screen markers and the hematoma. The best choice was the largest deck of traumatic epidural hematoma. When necessary, two puncture points were selected. (3) The head of the patient was pushed through the CT scan coils. Based on the marker to determine the position of the body surface, local disinfection was conducted. The electric drive pushed the 2.0 cm to 3.0 cm YL-1-type of disposable intracranial hematoma smash needle through the scalp and skull into the brain of the target under 2% lidocaine local anesthesia . Then, the drill core with rigid needle retention was drawn out to establish the channel between the intracranial area and the exterior. Afterward, a 20 ml syringe was used to aspirate the hematoma. The amount of hematoma aspirated was based on the degree of dissolved hematoma, which should at least be 2 ml. (4) Rechecking: The CT of the head was rechecked to confirm the position of the needle, and to ascertain whether there was residual hematoma or continuous bleeding. The closed drainage bag was then connected and returned to the ward. The operation in the CT room lasted for about 10 min. (5) Drainage: The draining was done continuously for 3 d to 5 d and urokinase was used to flush 2 to 4 times a day. About 3 ml of urokinase dissolved in saline was drawn every 5 or 10 million units for injection into the hematoma cavity, and released 2 h to 3 h after occlusion. The principle of urokinase use is the non-addition of intracranial pressure. (6) Withdrawal of needles: If epidural hematoma was less than 10 cc, no shift of midline structures occurred. No symptoms of increased intracranial pressure with the head CT were found during the rechecking. When the needle was drawn out, it was sutured at the local position if bloody fluid effused. (7) Pre-plan: If re-bleeding appeared, intracranial pressure increased during the process of puncture treatment. Thus, regular craniotomy was immediately conducted (11).

Evaluation Approach

(1) Improvement Rate: The GCS score of consciousness state after the intracranial puncture increased by 2 points. (2) Cure Rate: The patients were discharged when they were physically and mentally back to normal, and no complications or sequelae were found. This condition was considered a cure. (3) Puncture accuracy and accuracy rate: As observed from the cross-section of the CT, the closer the center of the largest deck of hematoma dot to the center, the higher the accuracy. The distance of the dot around the needle after puncture was measured with a ratio of less than 1 cm and less than 2 cm. From the CT section, as long as the needle was in the hematoma cavity, it was accurate. (4) Re-bleeding Rate: If local TEDH was larger than that before puncture, it was accepted as re-bleeding. (5) Puncture Infection Rate: If the local scalp showed redness, tenderness, and blood WBC over 10.0 E +9 / L after puncture, it was accepted as local infection (6). (6) The average stay days, which are days from hospitalization to hospital discharge. (7) The average medical cost, which is the medical cost from hospitalization to hospital discharge. (8) Follow-up Survey: Three months after hospital discharge, follow-up of the cases was done by telephone call.

RESULTS

After the puncture, the 33 patients exhibited an improvement rate of 100% and cure rate of 100%. The puncture precision of accuracy rate less than 1 cm was 83%, that of accuracy rate less than 2 cm was 100%, and the overall accuracy rate was 100%. The rate of re-bleeding was 0%, the puncture local infection rate was 0%, the average hospital stay was 7.5 days, and the medical cost average was two thousand U.S. dollars. From the telephone follow-up of the 30 patients, no complications or sequelae were found, and the patients reverted to normal life and work.

DISCUSSION

TEDH bleeding usually stops within 20 min to 30 min. A small amount of bleeding is still evident in the early stage, but will completely cease after 6 h (7). The tamponade effect of blood clots plays a certain role to stop bleeding (8). Therefore, a surgery performed too early after the injury incurs the risk of re-bleeding. Operating with stable hematoma is better, which occurs 7 h to 72 h after the injury. In the present study, the surgery was conducted 2.6 (1 to 6) d after the injury. TEDH is a common disorder in traumatic intracranial injury. The incidence rate of TEDH accounts for 17% of traumatic intracranial injuries (10). Without reasonable medical treatment, TEDH will further develop, threatening the lives of patients. Most patients were treated with craniotomy if supratentorial hematoma was greater than 30 ml or if infratentorial hematoma was greater than 10 ml (4). A small part adopted the conservative medical treatment because the epidural hematoma in patients was small, and no obvious symptoms of increased intracranial pressure were present (5). If the amount of the hematoma increased or the GCS score decreased, the surgical treatment should be prompt (1). However, some patients are neither suitable for craniotomy nor conservative medical treatment. Therefore, intracranial puncture is recommended for their treatment, and especially for old and teenage patients. Intracranial puncture can be viewed as a complementary method of the epidural hematoma surgical treatment, which is in line with the view of minimally invasive neurosurgery. After the intracranial puncture, the 33 patients conformed to the following conditions: (1) clear history of trauma, (2) conformed to single epidural hematoma, as checked by CT, (3) presence of supratentorial epidural hematoma, (4) hematoma volume less than 40 ml, (5) presence of the normal clotting mechanism, (6) state of consciousness GCS score greater than or equal to 7, (7) age is not a contraindication, (8) complex trauma cases are not included. Thus, a satisfactory therapeutic effect was achieved by the procedure.

The present study adopted the method of CT under the surveillance of YL-1-type disposable intracranial hematoma smash puncture needle aspiration in the treatment of TEDH. Unlike the CT-guided puncture, this method is based on CT scans to locate the part to be operated on. If the CT deck basically scanned by the standard OM line was not used, the spot of puncture was prone to error, which cannot recheck the head CT during the puncture. Bone drill drainage is needed to cut the scalp (2,12), whereas the intracranial puncture under the surveillance of CT did not require scalp incision. The puncture needle penetrated the skull through the scalp and into the hematoma cavity accurately. The metal markers were used as signposts to locate the area, which was more accurate. During the process of puncture, doctors can review the head CT and keep abreast of the needle position in the hematoma cavity, and ascertain whether residual hematoma or re-bleeding was present, which ensure safer and more reliable surgery. In the later stage, urokinase was used for lavage to ensure the thorough removal of the hematoma.

The surgery has the following advantages: (1) Simple operation conducted under local anesthesia in the CT room, which can be done in primary hospitals; (2) Minimally invasive surgical trauma, as the diameter of the puncture needle is only 3 mm; (3) Short operation time of only 10 min to 20 min, so patient stimulation is minimal. Thus, the elderly, or those with severely abnormal heart, lung, and kidney functions can tolerate it; (4) Easy postoperative management because the needle is fixed in place by the self-locking of the skull without position restrictions. The needle is sealed well to reduce infection and other complications; (5) Low-cost, short hospital stay, and exact treatment.

This method has some limitations. We choose cases with less than 40 ml hematoma volume.

The use of CT under the surveillance of YL-1-type disposable intracranial hematoma smash puncture needle aspiration for the treatment of traumatic epidural hematoma is a simple, fast, and accurate-positioning method that does not entail craniotomy and blood transfusion. The operation is safe and effective. Selecting the indications carefully and reasonably can make this method yield better therapeutic effect.

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