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Case Report
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Hemorrhage Caused by Closed Suction Drain in Patient after Posterior Cervical Surgery: A Case Report

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Abstract

The Closed Suction Drain (CSD) system is widely utilized in orthopedic surgeries. However, its side effects have seldom been mentioned. Hereby we report an impressive case of post-operative hemorrhage, which were probably caused by miss-chosen and mal-positioned CSD system. Meanwhile, invasion of vertebral venous plexus should also be taken into consideration when unexpected hemorrhage happened. After adjusting the type and position of the CSD system, this patient healed without any complication.

Keywords: Closed suction drain; Post-operative hemorrhage; Cervical surgery

Introduction

Closed Suction Drain (CSD), a medical drainage system consisting of an internal drain tube that connected to a pre-vacuumed container or grenade-shaped bulb, is commonly used as a direct and effective method to achieve evacuation of liquids or debris from cavities or wounds in surgical procedures [1]. Generally, CSD has been a routine procedure in orthopedics practices [1]. However, seldom studies have recognized the possible hazardous consequence bought by this technique. Recently, our institution confronted a case of unexpected post-operative iatrogenic hemorrhage caused by CSD system.

Case Presentation

A 50-year old female patient was admitted to our institution with a diagnosis of atlantoaxial dislocation and paraplegia on basis of conventional physical examination, CT scan, and MRI (Figure 1). She accepted posterior cervical surgery soon after. A posterior reduction of atlantoaxial dislocation and internal fixation with rod-and-screw system was then performed as described before [2] (Figure 2A, 2B). Both sides of vertebral venous plexus were invaded when placing the C1 lateral mass screw, and led to profuse bleeding, which was stopped by pressing and stuffing with gel-foam. Prior to closure, any existing bleeding was stanched with bipolar cautery, and the wound was irrigated copiously with saline to clean away all the debris, blood and devitalized tissue. A pre-vacuumed closed wound drainage system (Medinorm, Germany) was applied to avoid problems caused by potential bleeding and no vacuum suction was used before closure. The wound was then conventionally closed by intradermal suture after obtaining a dry wound. To our surprise, a profuse and rapid blood flow into the drainage container occurred right after the tube was connected to the 600 ml pre-vacuumed container and filled up to more than 200 ml in 60 sec. The vacuum suction was terminated immediately and incision was re-opened to the surgical field. However, no active bleeding could be found. The tip of drainage tube was found right point to the left side of invaded venous plexus. The drainage tube was then repositioned to keep away from both sides of venous plexus and gel-foam area, and incision was closed as above. A French JP drain was used instead. Finally, no more sustained blood loss occurred. The drainage tube was removed 48 h after surgery and the incision healed without any problem. No more complaint during the 10 months postoperatively.

Discussion

As described by Dougherty and Simmons, CSD mainly shows its values in reducing wound hematoma and post-operative edema, which would help to decrease the morbidity of infection and external contamination [3]. Nevertheless, side effects, such as multiple intracranial hemorrhages due to the over-drainage of cerebrospinal fluid [4], increased total blood loss and higher homologous blood transfusion rate [1], should also be given enough significance during daily applications. Hence, the application of CSD could be a potential risk for post-operative blood loss. In our case,

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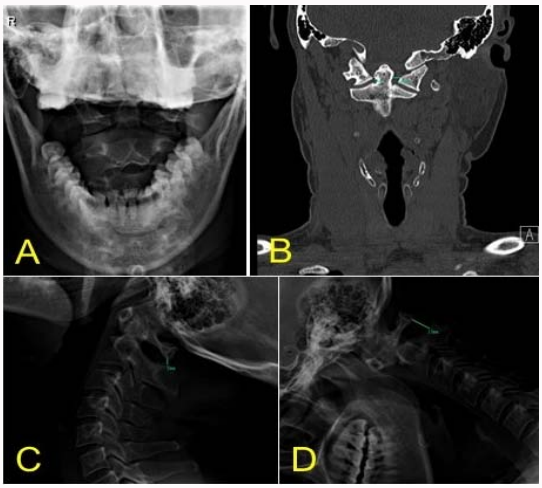

Figure 1: The AP open-mouth-projection of the odontoid peg showed atlantoaxial instability proved by CT scan with 3D reconstruction (A and B). The dynamic X-ray demonstrated an obvious instability of atlantoaxial joint (C and D).

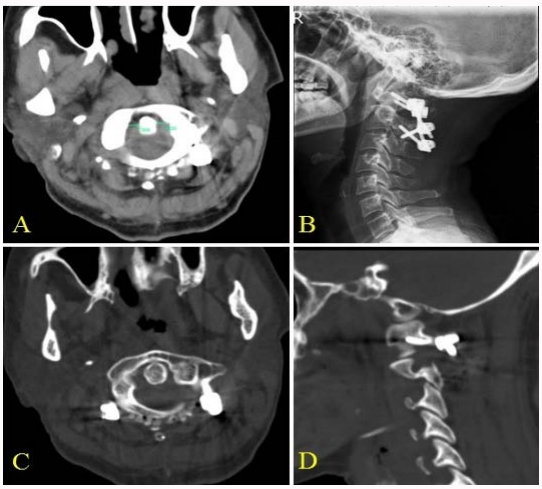

Figure 2: After surgery, the atlantoaxial was stabilized (A and B). The 3D reconstruction of CT scanning showed that the screw probably invaded the both sides of vertebral venous plexus just beneath the lateral mass of C1 (C and D).

we figured out that mal-positioned drainage tube and miss-chosen aspiration system should be the reason of such unexpected post-operative hemorrhage. The tip of tube was found right pointed to the invaded venous plexus, so was unsuitable for focal hemostasis and likely triggered direct suction. Moreover, the stuffed gel-foam, together with drainage tube, might work as a Vacuum Suction Drainage (VSD) system and then creates a vacuum phenomenon established through the drainage tube lying in it. Such specific device was associated with elimination of local tamponade effect and resulted in a continuous aspiration of blood from venous plexus. According to the Boyle's law [5], the 600 ml container provides higher and more persistent aspiration power comparing to the JP drain. Overwhelmed aspiration power might enlarge side effects of CSD, for instance, eliminated tamponade effect and dislocated local tissues induced by suction, and lead to terrible hemorrhage consequently. Hematoma is one of the main complications after orthopedic surgeries. The incidence of symptomatic post-operative spinal epidural hematoma, which requires intervention, has been reported to range from 0.1% to 3% [6]. Post-operative hematoma can be resulted from either patient- or surgical-related factors. Among those, the injury of venous plexus is a predisposing element. With its thin and fragile wall, venous plexus is vulnerable even to blunt traction. In addition, lack of valve deteriorates the local hemostasis and leads to disastrous hemorrhage eventually. The reported number of incidence and mortality of pre-sacral venous plexus injury were 9.4% and 4.3%, respectively [7,8]. Various hemostasis techniques have been introduced to clinical practice, including package of glue (gel-foam, fibril collagen, surgical and bone wax), thumbtacks and coagulation. However, unexpected blood loss in certain structures still takes places [9]. The invasion of vertebral venous plexus is another important factor contributing to post-operative hemorrhage in our current case (Figure 2C, 2D). The vertebral venous plexus, accompanying with deep cervical veins and anterior internal vertebral venous plexus, is a composition of vertebral venous system. Its initial portion starts from the atlanto-occipital space and connects with the anterior internal vertebral venous plexus in the manner of an intervertebral vein [10]. To our knowledge, neither clinical research nor case report could be found to convincingly clarify the occurrence or treatment of post-operative hemorrhage caused by this venous plexus system. This may result in deficient understanding to many spine surgeons and inevitably leads to unconscious damage as well as inadequate treatment. Summary, we present a new view of the merits of CSD system, which is not only for the prevention of post-operative hematoma, but also accompanying by accidental stimulation of iatrogenic hemorrhage. Mal-positioned drainage tube and miss-chosen aspiration system are two significant considerations. Besides, to master the local anatomy also should be kept in mind for orthopedic surgeon. We believe that improvements of above will benefit both orthopedic surgeon and patients.

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Patient Declaration Statement

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understand that her name and initials will not be published and due efforts will be made to conceal her identity, but anonymity cannot be guaranteed.

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