A Late Infection After Occipitocervical Instrumentation – A Case Report

Oksipitoservikal Enstrumantasyonun Geç Dönem Enfeksiyonu – Olgu Sunumu

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Özet

Oksipitoservikal bileşke patolojilerinde füzyon amacıyla farklı enstrumantasyon teknikleri uygulanmaktadır. Bir çok komplikasyona açık olan bu cerrahide özellikle geç enfeksiyon tablosunda uygulanan tedavi literatürde tartışmalıdır. Posttravmatik os odontoideum ve baziler invajinasyon nedeniyle tetraparetik olan; ağır pyramidal bulguları bulunan bir hastaya dens rezeksiyonu ile birlikte C0-C5 fiksasyon + otogreft ile füzyon tekniği uygulanmıştır. Post operatif progresif nörolojik düzelmesi olan hasta; post operatif 7. gün taburcu edildi. Hasta operasyonundan 8 ay sonra insizyon yerinden akıntı ve lokal enfeksiyon bulguları ile kliniğimize tekrar başvurdu. Öncelikli olarak geç dönem enstruman enfeksiyonu olarak kabul edildi. Hastaya antibiyoterapi ve hiperbarik oksijen tedavisi (4 hafta süre ile hospitalize edilerek) uygulandı. 4 haftanın sonunda enfeksiyonda iyileşme olmadı. Antibiyoterapi ve hiperbarik oksijen tedavisi ile enfeksiyon tablosunda remisyon sağlanamayan hastanın enstrumanı çıkarıldı. Post operatif kontrol dinamik grafilerinde C0-C3 füzyonun tam olduğu görüldü. Takiplerinde enfeksiyonun tekrarlamadığı ve laboratuar bulgularının normal düzeylere gerilediği tespit edildi. Bu olguda enstrumantasyon sonrası oksipitoservikal enfeksiyonda sağaltım ve bu tür operasyonlarda enfeksiyon riskini açısından yönetim tartışılmıştır.

Anahtar Kelimeler

Os Odontoideum; Baziller İnvajinasyon; Spinal Enstrumantasyon; Enfeksiyon

Abstract

Several fusion techniques involving instrumentation are implemented for the surgical treatment of certain pathological conditions of the occipitocervical junction. These surgical approaches may be associated with a number of complications including late surgical infections; the treatment of which is still disputed. In a tetraplegic patient with a history of post-traumatic os odontoideum and basilar invagination who had severe pyramidal signs; dens resection accompanied by C0–C5 fixation plus fusion with auto-grafting were performed. The patient was discharged on Day 7 after surgery with neurological improvement. Eight months after the initial procedure; he re-presented to our unit with discharge and signs of local infection at the site of surgery that were considered to be the manifestations of late instrumentation associated infection. The patient was admitted and antibiotics and hyperbaric oxygen were given for 4 weeks; with no improvement of the infection. Subsequently; surgical implants were removed. Postoperative dynamic x-ray images suggested complete fusion of C0-C3. During the follow-up period; no recurrence of infection was observed and the laboratory abnormalities returned to normal values. The treatment of occipitocervical infections after surgical instrumentation and the management of the infection risk in such cases are discussed below along with the case presentation.

Keywords

Os Odontoideum; Basilar Invagination; Occipitocervical Instrumentation; Infection

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Introduction

The term "os odontoideium" was originally coined by Gionni to describe the separation of odontoid from the body of axis [1]. The two major etiological mechanisms involve congenital factors and trauma [2]. This anatomical site; referred to as the craniovertebral junction; represents the most mobile part of the spine with 3-dimensional movement capabilities [3]. Failure to detect the traumatic injuries involving this joint at an early stage is associated with significant morbidity and mortality; placing extra clinical importance on the instability of this anatomical site. Surgical management of os odontoideum aims at achieving adequate neural decompression and occipitocervical stabilization [4]. For this purpose a number of different surgical equipment such as plaques; screws; wires and/or grafts may be utilized on the occipital bone and cervical vertebrae. However; in patients undergoing surgery that involves the use of such foreign material for spinal stabilization; early or late infections may occur.

In this presentation a patient with os odonteideum and basilar invagination with progressive neurological symptoms after trauma is described within the context of the management of late post-surgical infections and procedures that may be implemented to reduce the risk of infection in surgical treatments involving the use of instrumentation.



Figure 1. Surgical stabilization of the craniovertebral junction was accomplished through the use of occipitocervical plaques and fusion

Figure 2: Dynamic x-rays obtained after 4 weeks showed complete fusion between C0-C3

Case Report

An 11-year old male patient presenting to the emergency room with a fall from height injury had no signs of cervical injury or associated neurological pathology in his initial examination; leading to a decision to discharge him with medical advice. However; four months after the incident he presented to our unit with progressive gait disorder and loss of motor power in the hands that did not exist at the time of initial presentation. Neurological examination showed significant spasticity bilaterally in the upper extremities and bilaterally and distally in the lower extremities. Also; tendon reflexes were bilaterally hyperactive and extensor plantar reflex was detected. He was able to take one or two steps with support of the others. The results of the physical examination and neuroradiological studies suggested a diagnosis of os odonteideum and craniovertebral basilar invagination.

Surgical stabilization of the craniovertebral junction was accomplished through the use of occipitocervical plaques and fusion (Figure 1). In the second stage of the surgery; anterior decompression was performed through transoral approach to remove the compression on the brainstem. He was discharged on postoperative Day 7. During his follow up a progressive improvement in his hand skills; spasticity; and gait was observed. However at postoperative month 8 he re-presented to our unit with discharge at the site of the surgical wound. A cervical magnetic resonance imaging with contrast injection was performed but could not obtain clear images due to metallic artifacts. A sample from the discharge was obtained for microbiological studies. Also a complete blood count; CRP and procalcitonin test were ordered. WBC was 18500/mm³; CRP was 54.28 mg/L (range: 0-5); and procalcitonin was 2.7 ng/mL (0-0.5). Due to the growth of S. aureus in sample cultures; the patient was admitted and a combined antibiotherapy according to antibiogram results (cefazolin 1 g t.i.d and gentamicine 120 mg q.d) and hyperbaric oxygen treatment were planned for 3 months. Complete blood count; CRP and procalcitonin levels were regularly checked during this treatment. At 3 months WBC was 13000/mm³; CRP was 35.7 mg/L (0-5); and procalcitonin was 1.3 ng/mL (0-0.5). Despite reduction in the volume of discharge; a complete cure of the infection could not be achieved and the spinal surgical instruments were removed. During removal; debridement was performed at the wound site; which was also flushed with ample amount of physiological saline that contained rifocin. A hemovac drainage tube was placed at the epidural space and the surgery was terminated. The drainage tube was removed at postoperative Day 1. At postoperative Day 7 the wound site was clear; WBC was 8200/mm³; CRP was 7.6 mg/L (0-5); and procalcitonin was 0.4 ng/mL (0-0.5) and the patient was discharged. After 4 weeks; he was mobilized with a neck brace and he was given amoxicillin plus clavulanic acid at a dose of 1 g t.i.d. Dynamic x-rays obtained after 4 weeks showed complete fusion between C0-C3 (Figure 2). No recurrence of infection was observed during the follow up period; and his laboratory levels returned to normal. At postoperative



Figure 2. Dynamic x-rays obtained after 4 weeks showed complete fusion between C0-C3

month 6; a complete healing of the wound and normal laboratory results were detected.

Discussion

The craniovertebral junction consists of the occiput; atlas; axis; and the surrounding ligaments [5]. These structures envelop medulla ablongata; medullocervical junction; and the upper cervical spinal cord [6-7]. The management strategies in pediatric patients with suspected injury of the cervical spinal cord and the craniovertebral junction differ from those in adult patients in terms of immobilization techniques (invasive or non-invasive); diagnostic work-up; types of spinal injury; and follow-up procedures [5]. In patients with moderately severe clinical signs and symptoms (neck stiffness and pain); diagnosing the craniovertebral junction problems with standard cervical x-ray images may be challenging [8]. In line with this; no significant pathology or fracture was detected in the initial assessment of our patient at the emergency room.

The common indications for occipitocervical fusion include congenital problems; trauma; tumors; or degenerative bone disease. During occipitocervical fusion; sometimes segments caudal to the lesion may have to be included in the fusion; depending on the clinical presentation and radiological findings. The fusion may be extended up to the level of C3-C4; particularly in selected cases with basilar invagination; anterior decompression; and a certain degree of vertical migration [9]. Similarly; occipitocervical fusion was extended up to C4 segment in our patient due to the presence of os odontoideum and basilar invagination. The reported incidence of infection in patients undergoing fusion with spinal instrumentation varies between 0.4 and 8.7% [10-11-12]. Our patient presented to our unit 8 month after the initial procedure with signs and symptoms of local infection. Due to a possibility of instability leading to neural compression; initial strategy consisted of medical treatment with hospitalization rather than the removal of the spinal instruments. Combined treatment with intravenous antibiotics and hyperbaric oxygen was expected to result in the clearance of the infection and completion of the fusion. In a study by Bachy et al.; the initial approach recommended by the investigators in patients developing infections following spinal instrumentation consisted of wound debridement and use of suppressive antibiotics until the occurrence of solid fusion; which then may be followed by the removal of the implants after complete fusion has been achieved [13]. Also; hyperbaric oxygen treatment represents an effective therapeutic strategy that may be used in spinal infections [14]. Due to the absence of improvement despite 3 months of intravenous antibiotics and hyperbaric oxygen treatment; a decision was made to remove the implants in our patients. Dynamic x-ray studies following removal suggested that fusion has occurred.

Probably a thorough assessment of the risk factors is the single most important means of reducing the risk of infection in patients undergoing stabilization with plaque implantation. Presence of concomitant disorders such as diabetes mellitus (DM); anemia; malnutrition; or another focus of infection require further medical attention to prevent possible postoperative infections.

In the study by Allan et al. although a higher incidence of infections was observed in patients undergoing transoral surgery; our patient endured an infection following surgery with posterior approach. However; probably the most dramatic observation in the study by Allan et al. was the association between the site of surgery and the infection risk whereby no patients undergoing anterior stabilization had an infection. On the other hand; posterior approaches were associated with a higher risk of infection. Also; surprisingly; the infection risk in occipitocervical procedures was higher as compared to other anatomic locations where stabilization was performed [15].

Possible explanations for the lower risk of anterior approaches include the use of anatomic cleavages; occurrence of lower volumes of blood loss; and smaller volume of death spaces left after surgery. Conversely overextension of the incision in caudal and cephalic directions and use of wider incisions as to include the transverse processes in order to achieve better exposure of the posterior elements may be responsible for the higher infection risk in posterior procedures. For this approach; muscular tissues should be retracted for prolonged periods of time; resulting in the impairment of the blood flow to muscles that may lead to muscular ischemia. Also; prolonged surgery; higher volume of blood loss; and presence of blood-filled death spaces may contribute to this increased risk of infections [2].

In patients undergoing spinal stabilization with instrumentation; after patient-related risk factors are addressed; the site of surgery should be properly chosen; death spaces should be minimized following surgery; retracted muscles should be relaxed at regular intervals; and blood loss should be minimized.

Conclusion

Infections occurring after craniovertebral stabilization or other stabilization procedures involving any segment of the spinal column may be associated with significant morbidity and mortality. In order to decrease the risk of infection following complicated surgical interventions of the craniocervical junction; first the risk of infection should be thoroughly assessed preoperatively in order to take the required precautions; and then ischemia in tissues affected by the surgical procedure should be kept at a minimum. On the other hand; watchful follow-up with antibiotic treatment followed by the removal of the implants if required may increase the success rate of the surgery. Finally; direct x-ray examination may fail to adequately diagnose these conditions in patients with cervical trauma. Therefore use of advanced imaging modalities should always be considered in conjunction with the assessment of the clinical signs/symptoms and the results of a comprehensive neurological examination.

Competing interests

The authors declare that they have no competing interests.

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