Management of a Complex Basilar Invagination Case with Multiple Revision Surgeries – Case Report

Tratamento de invaginação basilar complexa com múltiplas cirurgias de correção – relato de caso

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Abstract

We describe a Basilar Invagination (BI) case with craniocervical instability and many previous failure surgeries and poor wound coverage. The patient had been submitted to a large posterior fossa craniectomy (which greatly limited the availability of an adequate area for bone fixation) and showed a poor quality of the surgical wound in the posterior craniocervical region. We performed an occipito-cervical fixation, using the bone overlying the torculla as a point of cranial fixation. Craniocervical realignment was achieved by the use of distractive maneuvers with occipital rods, followed by coverage of the hardware via a pedicled longitudinal trapeze myocutaneous flap. We used local ribs removed from the region where the myocutaneous flap was harvested as autologous bone grafts for craniocervical fusion. Post-operatively, the patient was placed in a halo-vest for three months. The patient improved substantially after the procedure, recovered some muscular strength and experienced total relief of her pain. We hereby discuss the surgical strategy used for treating this complex case in details, with illustrative pictures.

Keywords

► basilar invagination
► craniocervical
► junction
► wound infection

Palavras-chave

► invaginação basilar
► junção craniocervical
► infecção de ferida


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Introduction

Basilar invagination (BI) is one of the most common cranio-cervical junction congenital anomalies.\(^1,2\) The diagnosis is made in the presence of a prolapsed upper cervical spine into the skull-base, precisely when the tip of the odontoid process is located at least 2 mm above the Chamberlain line.\(^1,2\)

Many other bone anomalies are associated with BI, such as clival, occipital condyle, or atlas hypoplasia, atlantooccipital assimilation and congenital atlantoaxial instability.\(^3\)–\(^5\) Tonsillar herniation, syringomyelia, and hydrocephalus are neural axis anomalies commonly found associated with BI as well.\(^2\)

Patients may present clinical symptoms at all ages, but the majority of them are symptomatic in the second or third decades of life.\(^4\) Symptoms and signs may include cervical pain, torticollis or limited neck movements, neurological deficits, such as muscular weakness, gait abnormalities, bladder dysfunction or even lower cranial nerves dysfunction, especially swallowing problems.

Surgical treatment is generally indicated in the presence of symptoms.\(^5\) However, the management of BI patients is quite complex and depends on the site of neural tissue compression, on the presence or absence of cranio cervical instability, on the presence of syrinx or tonsillar herniation, and on the surgeon’s experience, among others.\(^3\)–\(^5\),\(^6\)

In this paper, we present a case of a 42-year-old woman with multiple previous cranio cervical junction surgeries for treatment of BI with cranio cervical instability and severe wound problems due to her previous wound infections and hardware exposure. We discuss the strategies used to restore the cranio cervical alignment, performing neural decompression and fusion, and those that were used to provide an adequate wound closure.

Case Report

A 42-year-old woman was referred to our outpatient clinic in 2012 for treatment of refractory cervical pain after failed “Chiari I malformation” surgery. She presented with global muscular weakness (muscular strength grade IV) and pyramidal signs. Her ambulation was severely limited by her pain.

On a two-year-span she had undergone five surgical procedures in another hospital that included a posterior fossa decompression to complex cranio cervical decompressions, realignment, and instrumented fusions, or even tranoral decompressions in cases of irreducible anterior compression.\(^1\),\(^3\)–\(^5\),\(^6\)

In the revision surgery, we addressed all the potential issues...
**Fig. 1** Preoperative CT scan at the admission in our institution. (A) Sagittal CT scan showing listhesis of the atlantoaxial joint and (B) basilar invagination with the tip of the odontoid protruding into the foramen magnum. Note that the posterior fossa bone was completely removed. (C) CT scan after traction and the first occipito-cervical fusion with wiring techniques in the edges of the remained occipital bone. (D) Sagittal CT scan showing reduction of the protruding dens as well as reduction of the atlantoaxial listhesis. (E) CT scan reconstruction with craniocervical instrumentation.

**Fig. 2** CT scan after removing the occipital harwdare after wound breakage. (A), (B), and (C): sagittal CT scan showing the subaxial instrumentation and pseudoarthrosis with non-union of the craniocervical junction. (D) CT scan reconstruction with the rods attached in the subaxial spine. (E) Sagittal T2 sequence MRI showing severe anterior brainstem compression at the craniocervical junction and the posterior fossa totally decompressed.
related to failure, including postoperative planning, such as the use of a halo-vest for potentially improving the fusion rate in a patient with poor bone quality and previous failure.  

**Conclusion**

As final conclusion, craniocervical junction anomalies may require a multidisciplinary team for addressing all the complex issues involved in their treatment, to achieve better outcomes and surgical results. It is, thus, mandatory that all the potential aspects that may cause surgical failure be considered in the management of BI.

**References**