Objective: To report the difficulties in managing a case of os odontoideum. Methods: Female patient, 12 years old who developed a quadriparesis after minor cervical trauma in October 2005. In the emergency department a congenital cervical anomaly was identified. The patient was placed in a Stryker® frame and, few days later, in a halo bracing. After 3 months, an infection around the pins emerged and the halo vest had to be removed. A severe C1-2 instability persisted and a C1-C2 Gallie procedure was attempted. In the following weeks the bone disappeared and another procedure was attempted in June 2006 - C1 laminectomy and occiput-C3 fusion. In the following months the neurological status of the patient improved and a complete mass of occiput-C3 fusion was observed. Results: We choose a posterior cervical arthrodesis of C1-C2 using the Gallie technique. Since the condition was not resolved we performed a second surgery, C1 laminectomy (determined by SAC of 8, 3 mm in MRI) followed by posterior occiput-C3 fusion. In our case, until now, there is no evidence of axial decompensation, but a more prolonged follow-up is needed. Conclusions: The treatment of os odontoideum has many considerations but the essential that in the presence of instability and neurological deficit a solid fusion is achieved. In case of failure of posterior atlantoaxial wiring, the occiput-C2 or C3 fusion with rods seems to be an excellent option with a high rate of success, avoiding the need for additional support.

Keywords: Odontoid process/surgery; Odontoid process/radiography; Cervical vertebrae; Spinal injuries.

Resumo
Objetivo: Relatar as dificuldades no tratamento de um caso de os odontoideum. Métodos: Paciente do sexo feminino com 12 anos de idade que desenvolveu tetraparesia após trauma cervical discreto em outubro de 2005. No departamento de emergência, constatou-se uma anomalia cervical congênita. A paciente foi colocada em cama Stryker® e alguns dias depois, em colete Halo Vest. Depois de 3 meses, ocorreu infecção em torno dos pinos e foi preciso remover o colete. Houve persistência de instabilidade C1-C2 grave, tentando-se a resolução com a técnica de Gallie C1-C2. Nas semanas seguintes, o enxerto desapareceu e outro procedimento foi tentado em junho de 2006 – laminectomia de C1 e fusão occipital-C3. Nos meses posteriores, o estado neurológico da paciente melhorou e verificou-se massa de fusão completa occipital-C3. Resultados: Escolhemos a artrodese cervical posterior C1-C2 usando a técnica de Gallie. Uma vez que o problema não se resolveu, realizamos uma segunda cirurgia, laminectomia de C1 (determinada por SAC de 8, 3 mm na RM) seguida de fusão occipital-C3. Em nosso caso, até agora, não há evidência de descompensação axial, mas é essencial um período maior de acompanhamento. Conclusões: O tratamento de os odontoideum tem muitas considerações, mas é essencial, na presença de instabilidade e déficit neurológico, obter fusão sólida. Em caso de falha de amarrilho atlanto-axial posterior, a fusão occipital-C2 ou C3 com hastas parece ser uma opção excelente, com alta taxa de sucesso, evitando a necessidade de suporte complementar.

Descritores: Processo odontoide/cirurgia; Processo odontoide/radiografia; Vértebras cervicais; Traumatismos da coluna vertebral.

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Descritores: Apófisis odontoides/cirurgia; Apófisis odontoides/radiografía; Vértebras cervicales; Traumatismos vertebrales.
INTRODUCTION

In 1863, separation of the odontoid process from the body of the axis was described in a postmortem specimen. In 1886, Giacomini coined the term os odontoideum1,2.

Os odontoideum is rare, but the exact frequency is unknown. Known cases are either incidentally detected or are diagnosed when patients become symptomatic. No large-scale screening studies have been performed1.

Based on the position of the dens tip os odontoideum is described as orthotopic or dystopic. In an orthotopic os odontoideum, the dens is in anatomic position. A dystopic os odontoideum is present when the dens is in any other position2,3 (Figure 1).

CASE REPORT

The authors report a case of a twelve year old female that developed a tetraparesia after a minor cervical trauma in October of 2005. In the emergency department a congenital cervical anomaly was identified. The patient was placed in a Stryker® frame and, few days later, in a halo bracing. After 3 months an infection around the pins emerged and the halo had to be removed. A severe C1-2 instability persisted and a C1-C2 Gallie procedure was attempted in January of 2006, 3 months after trauma. In the following weeks the graft disappeared and a severe C1-C2 instability persisted with the space available for the spinal cord was 10,8 mm in the X-ray and 8,3 in the MRI (Figures 2 and 3). Another procedure was attempted, in June 2006, that was a C1 laminectomy and fusion Occipital-C3 with Vertex System® (Medtronic) five months after the first procedure (Figure 4-5). In the following months the patient neurological status improved, allowing her to walk without assistance and to make her normal daily life activities. In July, 2 months after Occipital – C3 fusion, the fusion was evident in the X-ray. In the next one and half year of follow up she gained a good function – with only a functional grade 3 of 5 in intrinsic muscle of the left hand (C7/C8) as residual deficit - and a complete mass fusion Occipital – C3 was visible in July 2007 (Figure 6).

DISCUSSION

The primary factor that causes post-traumatic tetraparesia, frequently secondary to a slight trauma, is atlantoaxial instability. The stability of the atlantoaxial articulation depends fundamentally upon integrity of the odontoid process and the ligaments. When the odontoid process is disrupted, from traumatic or nontraumatic causes, the atlas will displace along the odontoid process, leading to instability2. The differential diagnosis of injuries of the upper cervical spine in children includes fractures through the base of the
OS ODONTOIDEUM – CASE REPORT

evaluation of the patients is mandatory with anterior and lateral ra-


4. Osti M, Philipp H, Meusburger B, Benedetto KP. Os odontoideum with bipartite atlas and

1. Sankar WN, Wills BP, Dormans JP, Drummond DS. Os odontoideum revisited: the case for

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2. Good radiological odontoid process at the vestigial disc between the odontoid and the

odontoid process at the vestigial disc between the odontoid and the

body of C2 and atlantoaxial rotatory subluxation2. Good radiological evaluation of the patients is mandatory with anterior and lateral ra-

diographs of the cervical spine and open-mouth anterior-posterior4.

Os odontoideum appears as a round or oval ossicle with a

smooth uniform cortex separated from the base of the axis by a

wide gap3,6. The ossicle border does not directly match up with the

axis body. The wide gap separating the os odontoideum and the

axis should lie above the level of the superior articular facets5. The

critical space available for the spinal cord (SAC) was proposed as 13

mm6. At the level of atlantoaxial joint, the spinal cord has a diameter

of 8 – 11 mm, and the transverse ligament has a diameter of 4 mm4.

In this case remains a 10, 8 mm space in Rx and 8,3 mm in MRI. A

SAC of 11 mm is related with clinical improvement after a solid

arthrodesis. It is important to check instability index since patient

with more than 40 % have a high risk of myelopathy. Another factor

of high risk is sagittal plane rotation angle with more than 20 degrees

associated with a high risk of developing myelopathy7.

Patients with posttraumatic progressive neurological deficit

should be treated surgically5,7. Different treatment methods have

been advocated by different authors2,6. The standard surgical tech-

nique is posterior atlantoaxial wiring with either a Gallie or a Brooks

fusion. The Magerl like procedure was not an option because of the

patient age. We have chosen a posterior cervical arthrodesis of C1 –

C2 using a Gallie technique. In patients with os odontoideum, poste-
rior subluxation can occur with the Gallie procedure. This problem is

related with over-tightening of wiring that causes posterior translation of the C1 ring and brings the ossicle into the canal and against the

spinal cord. It is important that radiographs are obtained intraopera-
tively assuring that the patient is fused in a neutral position9.

Another major complication is nonunion, reaching 30 % when a

fusion C1 – C2 with posterior atlantoaxial wiring is attempted. Pos-
terative management is important to avoid this complication. This

includes a cervical bracing, as in our patient, or even a halo - bracing.

Serial radiographs should be obtained to ensure progression to fusion

and maintenance of stability. Nakagawa has presented a series of oc-
cipitocervical fusion in children, using rectangular rods that eliminated

the complications associated with the halo and wire techniques for

C1 – C2 fusion9 Wudbhav reported a series of 15 patients that were

fused C1-2 or C0-C2 with or without wiring, with 4 non unions, 2 of

them occurring in the 3 patients that were not placed in a halo jacket1.

On the second surgery the option for a C1 laminectomy was de-
termined by a SAC in MRI of 8, 3 mm. In presence of a myelopathy it

is safer to relieve the compression of the spinal cord between the os

odontoid process and the posterior arch of the atlas avoiding unexpec-
ted cord injury during the surgical procedure. The C1 laminectomy

was followed by posterior occipito – C3 fusion.

We have to limit the posterior exposure of the cervical spine to

prevent extension of the fusion to subjacent levels10. This has been

reported in 42% of the children in the Parisini reports11.

At this cervical level the optimum C1-C2 fusion angle should

average 20º and in our case it has reached 38º. This alteration may

implicate a change in sub axial alignment that may be resolved with

the follow up. The cases with compensatory sub axial changes were

found in patients whose fusion angle exceeded 30º11. In our case,
in our case, until now, it is not evident sub axial decompression but a more

prolonged follow-up is needed.

CONCLUSION

The treatment of os odontoideum has many considerations but

the essential in the presence of instability and neurological deficit

is to obtain a solid fusion. The halo bracing is the key factor of the treatment. It should be used to achieve a more anatomical position

before and during surgery and, after surgery, to ensure good immo-
bilization until a solid fusion is achieved. In the case of a failure of a

posterior atlantoaxial wiring a C0 – C2 or C3 fusion with rods appear

to be an excellent option with a high rate of success, avoiding the

need of a supplementary support.

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Figure 5. Lateral cervical spine showing C0 – C3 fusion in reduced position.

Figure 6. Lateral cervical spine showing C0 – C3 fusion in reduced position

after one and half year

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