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Case Report

The Use of Coblation in the Surgery of the Juvenile Angiofibroma

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REZUMAT

Utilizarea coblației în chirurgia angiofibromului juvenil

Coblația este un tip de tehnologie chirurgicală care constă în aplicarea de radiofrecvență pe țesuturile moi. Această tehnologie utilizează radiofrecvența în modul bipolar prin intermediul unei soluții conductoare, cum ar fi serul fiziologic. Energizează ionii aflați în solutia salină ceea ce determină formarea de plasmă în zona de interes chirurgical. Angiofibromul juvenil reprezintă mai puțin de 1% din tumorile capului și gâtului. Acest tip de tumoră apare exclusiv la sexul masculin, cu o medie de vârstă cuprinsă între 13 și 17 ani. Este o tumoră rară, fiind caracterizată de epistaxisuri unilaterale, recurente, severe, greu responsive la tratament convențional, ce pot pune în pericol viața pacientului. Scopul acestei lucrări este de a ilustra utilizarea coblației în ablația angiofibroamelor juvenile. În acest sens vom prezenta anumite date privind coblația, angiofibromul juvenil și o prezentare de caz.

Cuvinte cheie: coblație, angiofibromul juvenil, abord endoscopic

ABSTRACT

Coblation is a surgical technology which consists in delivering radiofrequency energy to soft tissue. This technology uses radiofrequency in a bipolar mode with a conductive solution, such as saline. It energizes the ions in the saline to form localized plasma near the tissue placed in the area of surgical interest. Juvenile angiofibroma represents up to 1% of the head and neck tumors. This kind of tumor occurs almost exclusively in male patients and the average age of onset is 13 to 17 years old.This rare type of tumor is characterized by unilateral, recurrent, severe epistaxis, reluctant to conventional treatment, that can endanger the patient's life. The aim of the present paper is to illustrate the use of coblation technology in the surgical ablation of the juvenile angiofibroma. In this respect we present some data concerning coblation, juvenile angiofibroma and a case report.

Key words: coblation, juvenile angiofibroma, endoscopic approach

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BACKGROUND

Coblation is a surgical technology which consists in delivering radiofrequency energy to soft tissue. This technology uses radiofrequency in a bipolar mode with a conductive solution, such as saline (1). It energizes the ions in the saline to form localized plasma near the tissue placed in the area of surgical interest. Plasma's energy dissociates water molecules from saline solution thus providing the optimal chemical conditions for breaking the tissue's molecular bonds (2).

The application of this technology has three effects: tissue ablation, localized removal and tissue volumetric reduction (2). The dissipated heat by using this type of radiosurgery is significantly lower than common radiofrequency techniques. This is due to intrinsic of the chemical process and the continuous cooling of the tissue from the surrounding saline solution at the level of the instrument's tip (3). In this way the temperature rises to 45-85°C (1, 2). The decreased thermal effect of coblation, better than classic radiosurgery, induces a gentle but efficient surgical effect in the target area. Thus the surgeon can gently remove tumors, small organs (tonsils) and can melt some anatomical structures (turbinate, palate, base of tongue). There is a large field of surgical applications in the pathology of the upper aero digestive tract.

The aim of the present paper is to illustrate the use of coblation technology in the surgical ablation of the juvenile angiofibroma. In this respect we present some data concerning juvenile angiofibroma and a case report.

Juvenile angiofibroma represents up to 1% of the head and neck tumors. This kind of tumor occurs almost exclusively in male patients and the average age of onset is 13 to 17 years old (4). The origin of this tumor is considered to be the posterolateral nasal wall next tothe sphenopalatine foramen. It is believed that the juvenile angiofibroma is a vascular malformation. The primary blood supply is he internal maxillary artery that arises from the external carotid artery despite of the fact that recent anatomical studies has revealed thatin near 30% of cases the tumor is also supplied with blood from the internal carotid artery.

Histology of the tumor shows miofibroblastic cells origin and a fibrous connective tissue with abundant endothelium lined vascular spaces contained in a pseudo capsule of fibrous tissue. The blood vessels lack a complete muscular layer.

The juvenile angiofibroma has intracranial extension in nearly 10-20% of cases and it has a high recurrence rate of almost 50% (5). The tumor is locally aggressive and destructive and it develops from the nasal cavity to the nasopharynx, paranasal sinuses, orbit, skull base, pterygopalatine and infratemporal fossa.

The symptoms are: unilateral nasal obstruction, unilateral epistaxis, and headaches that may appear due to the secondary sinusitis, when the tumor is blocking the paranasal sinuses

The diagnosis is based on the endoscopic exam and imagery (CT, MRI, angio MRI and angiography) where we can determine the extensions of the tumor and blood supply. Preoperative biopsy is prohibited because of the risk of severe bleeding from the tumor.

Proper imagistic diagnosis will help the surgeon to select the least traumatic approach of the tumor with secure hemostatic control and maximum preservation of anatomy responsible for facial growth.

Some authors reports intra-operative blood loss of near 8000 ml of blood and sometimes they were forced by the blood loss to stop the surgery before removing all tumoral extensions (6).

Differential diagnosis is made with: osteoma, craniopharyngioma, olfactory neuroblastoma, chordoma, chondrosarcoma, rhabdomyosarcoma and nasopharyngeal carcinoma.

There are several staging systems but the most used one is Radkovski nasopharyngeal angiofibroma staging system (7).All this staging systems depend on the site and the extent of the tumor.

A new staging system was imagined by the University of Pittsburgh Medical Center that incorporates the following prognostic factors that were not addressed by prior staging systems: route of extension and residual vascularity following embolization (8) (**Table 1**).

Management

The surgeon has to select the most suitable approach in order to have minimum blood loss, to be able to remove all tumoral extensions and to respect the anatomy that is responsible for facial growth. Different surgical techniques have been used for the approach of the juvenile angiofibroma: trans palatal, lateral rhinotomy, midfacialdegloving, Lefort 1 osteotomy. Recently introduced endoscopic techniques are used as a common surgical approach.

Table 1. UMPC Staging System (8)

Stage	UMPC Staging System
I	Nasal cavity, medial pterygopalatine fossa
II	Paranasal sinuses, lateral pterygopalatine fossa, no residual vascularity
III	Skull base erosion, orbit, infratemporal fossa, no residual vascularity
IV	Skull base erosion, orbit, infratemporal fossa, residual vascularity
V	Intracranial extension, residual vascularity

M, medial extension, L, lateral extension

The surgeon has to select the most suitable approach in order to have minimum blood loss, to be able to remove all the extensions of the tumor, to respect the anatomy that is responsible to facial growth.

The endoscopic approach seems to have some advantages in comparison to traditional ones: lack of facial incisions, no need for facial bones removal (can determine facial asymmetry), the ability of multi-anglevision, magnification of the mass surrounding tissue, surgeon is able to find residual tumor mass beyond corners or inaccessible areas, less complications and a decreased duration of hospitalization (9, 10).

The endoscopic approach of the juvenile angiofibroma cannot be always used andsometimes must be converted to an external one. The surgical team must be able to use endoscopic or external surgical approach as well.

We are using the following preoperative protocol: CT, MRI, angiography with embolization of the blood supply, blood test and blood supply order.

Surgical protocol

The surgery must be performed in 24-72 hours after embolization of the tumor. We never performed external carotid ligation as tactical step before tumoral approach. We are performing internal maxillary artery endoscopic clipping as a tactical step, the approach is done through the posterior wall of the maxillary sinus, endoscopically. Then the vascular pedicles are being exposed the surgeon must be careful not to perforate the capsula of the tumor, a fact that will cause important bleeding. The exposed vascular pedicles will be cauterized and then the tumor will be removed trans nasally or trans orally, depending onits size. The extensions in the pterygopalatine or temporal fossa will be removed by performing careful traction of the tumor since the juvenile angiofibroma does not have important adhesions to the structures from the pterygopalatine and infratemporal fossa. We are using nasal packing with Merocel, thatis usually extracted 48 hours after surgery.

During the surgery it is important to keep the blood loss within reasonable margins. This is the reason we started to use the coblation in the surgery of the juvenile angiofibroma. This technology was first used for tonsil and adenoids surgery. It consists in closing an electrical arch (5000V) in saline solution that will lead to high energy plasma cloud formation. The plasma cloud will vaporize the tissue with good bleeding control. During plasma vaporization the tissue is continuouslyirrigated with saline solution and in that manner the temperature of the tissue is relatively low (1). That surgical technology does not appear to necrotize the surrounding tissue (3). We have used the ArthrocareCoblator II with the continuous irrigation pump. The plasma wand that we have used is the Procise EZ View wand that was designed for nasal polyposis surgery.

CASE REPORT

We present the case of a 17 years old male that presented in our hospital for recurrent epistaxis, unilateral nasal obstruction and acute respiratory stree, during the night.

The ENT exam revealed a tumor that completely obstructedthe right nasal fossa and occupied the entire rhinopharynx. The suspicion of a juvenile angiofibroma was raised and it was confirmed using the CT exam.

The CT exam showed an encapsulated tumor occupying the entire right nasal fossa extended to the right etmoid and sphenoid sinuses, to the pterygo-maxillary fossa and nasopharynx (**Fig. 1**, **Fig. 2**).

A selective embolization of the main arteries feeding the tumor was performed and patient went into surgery 48 hours later. By using the coblation wand we performed partial sclerosis of the tumor in order to identify the main tumoral pedicle. This shrinkage of the tumor allowed us to identify the insertion of the pedicle at the level of the pterygoid plate and the choana. These insertions were cauterized trans nasally by using the coblator (**Fig. 3**). The extension in the pterygopalatine fossa was gently mobilized by using endoscopic blunt dissection and the tumor was removed en bloc (**Fig. 4**).

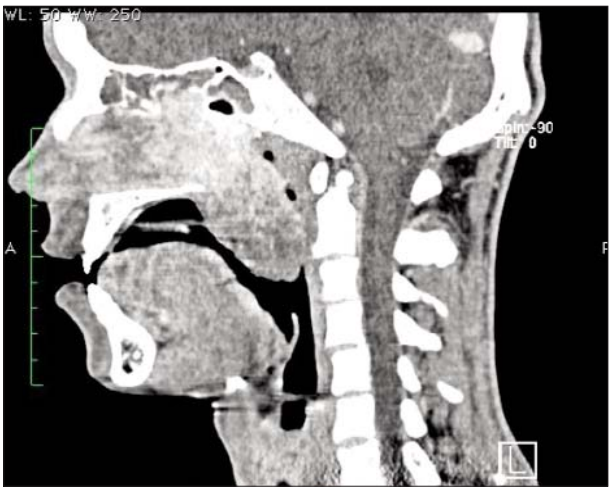

Figure 1. CT - Sagital view of the juvenile angiofibroma

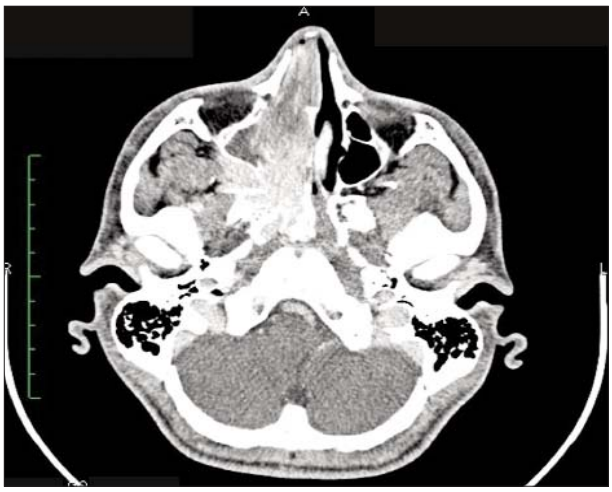

Figure 2. CT - Transverse view of the juvenile angiofibroma

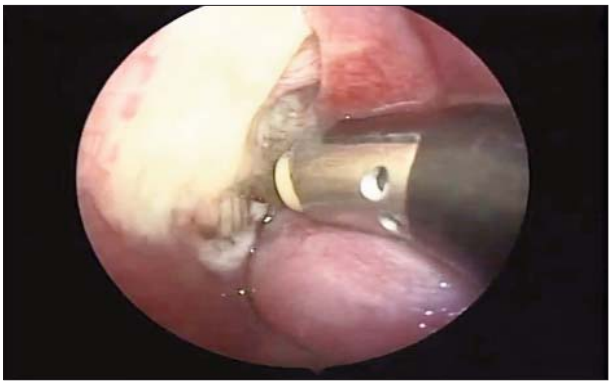

Figure 3. Cauterization of the tumoral pedicle using coblation

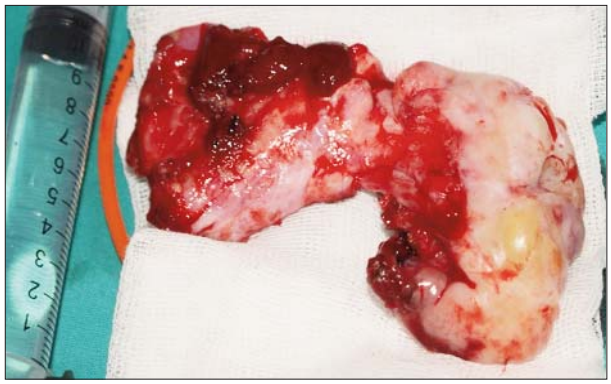

Figure 4. "En bloc" resected tumor

The patient was packed with Merocel number 8 bilaterally for 48 hours. After removal of the nasal package an endoscopic exam was performed showing no sign of macroscopic residual tumor.

The blood loss was around 150 ml.

The follow up at 1, 3, 6 months showed no signs of tumoral recurrence (**Fig. 5**).

CONCLUSION

In conclusion we have found the coblation technology to be useful in controlling the blood loss during juvenile angiofibroma surgery. We consider the endoscopic approach of the angiofibromato be a good alternative to external classical approaches. The complications are smaller compared with conventional approaches.

It can be used first for small angiofibromas, but there is a learning curve and it is a viable approach for large angiofibromas even when theyinvolve the skull base.

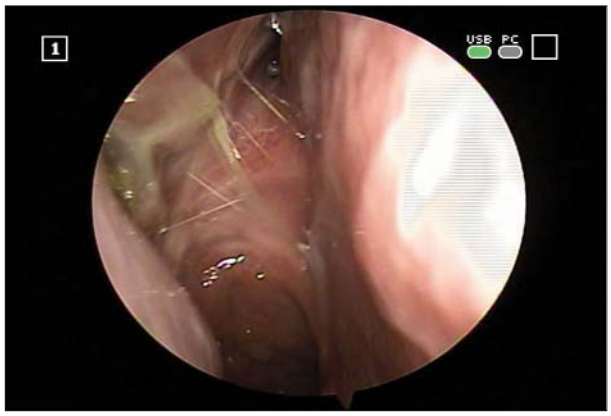

Figure 5. Image of the right nasal cavity 1 month after surgery

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