

THE IMPORTANCE OF 3D ENDOSCOPY IN THE SINONASAL MALIGNANT NEOPLASMS

Virgil Vasca¹, Elisabeta Maria Vasca¹, Filippo Ricciardiello², Flavia Oliva², Massimo Meselella², Ioana Lile¹, Liviu Tuturici¹

¹ Faculty of Medicine, Pharmacy and Dental Medicine, "Vasile Goldis" Western University Arad, Romania

² ENT Complex Operative Unit, Naples University "FEDERICO II", Naples, Italy

Keywords: tumors, three-dimensional, endonasal approach, nasal cavity, metastasis

INTRODUCTION

The sinonasal malignant tumors are rare, representing less than 3% of the cervicofacial neoplasms and 0.8% of all human cancers. Approximately 55% have their origin in the maxillary sinuses, 35% in the nasal cavity, 9% in the ethmoid sinuses and 1% in the frontal and sphenoid sinuses. The malignant sinonasal tumors affect less than 1 person out of 100,000 individuals per year in most countries. With the exception of non-epithelial tumors, the sinonasal cancer represents a disease that affects grown-up persons, with an increased occurrence among men older than 50 (in their sixties and seventies). Excluding the occupational factors, the males-females rate is of around 2:1.

MATERIAL METHODS

The study was made on 120 patients with different types of tumor formation, 70 of whom the diagnosis was made with 3D endoscopy and at 50 with classic diagnostic techniques.

RESULTS

The tumors localized in the nasal cavity shall emerge sooner than the ones from sinuses which should penetrate the bone limit in the nose, orbit or in the intracranial cavity. Considering the fact that these initial symptoms are often overlooked by the patient and clinicians, the tumor often involves several regions where it appears, being difficult to determine the point of origin.

The squamous cell carcinoma

Most of squamous cell carcinomas probably develop in the maxillary sinus and are usually treated by surgery combined with chemo-radiation; although in the case of poorly differentiated or non-differentiated sinonasal carcinomas, the chemo-radiation could be enough to cure the person. Occasionally, this type of tumor affects the nasal septum or the nasal columella which is associated with a negative prognosis, partially due to the

possibility of bilateral metastasis spread towards the cervical nodes.

The adenocarcinoma

The adenocarcinomas usually appear in the middle meatus and spread towards the ethmoid region and from there they can spread further towards the glabella or backwards to the sphenoid-ethmoid cavity and nasopharynx. Association of this disease with labour in the field of timber processing is well-known, but the tumor may emerge without such exposure as well. It is relatively radio-resistant but combined therapies are often used. Cranio-facial resection is often used but endoscopic surgery may also be an option in some cases.

The tumor-reduction surgery combined with 5-fluorouracil topical treatment has been used by some specialists.

The adenoid cystic carcinoma

Has the tendency to spread embolic and directly along the perineural lymphatic region and by means of blood metastasis which means that the treatment with excision is difficult especially because the late natural recurrence history can be a lengthy one. Therefore, although the 5-year life prognosis may be encouraging, within 20 years, less than 5% of the patients can be alive. The treatment consists of combined chemotherapy and radiotherapy, although radiotherapy alone, only delays the recurrence rather than increasing the efficiency of the treatment.

The olfactory neuroblastoma

The olfactory neuroblastoma or esthesioneuroblastoma classically appears in the olfactory epithelium from the upper nasal cavity and then spreads in the intracranial region in an incipient phase, involving the olfactory bulbs and tracts. The occurrence is higher than expected due to state-of-the-art diagnosis technology. The disease emerged in a group of people aged 12 to 70 (average 46 years) from a number of 42 patients.

The cervical metastasis have been present in a percentage of 23%. Craniofacial resection was specially designed as treatment for this tumour because it allows total resection of the olfactory apparatus. Following an analysis of the results, a higher occurrence has been registered in the cases when craniofacial resection has not been combined with radiotherapy, therefore this second method should always be presented as an alternative means of treatment.

Adjuvant chemotherapy is also provided in many cases. The endoscopic resection is more and more used for this type of tumours, especially when this appears from the middle and upper nasal turbinate and should be associated with radiotherapy. Long-term treatment is necessary and important because a late recurrence was observed after 14 years have elapsed from the initial treatment, sometimes considerably later than the initial lesion.

Sinonasalhemangiopericytoma

Represents a rare mezenchinaltumourof the sinonasal region characterized by a perivascular protuberant pattern. It mostly affects 60-70 year-old patients of both sexes. The most usual clinical picture is represented by a unilateral nasal obstruction and/or epistaxis with a polypoid mass in the nasal cavity. The X-rays emphasize the opacification caused by the polypoid mass, sometimes associated with a bone erosion and sclerosis.

From a histological point of view there is a submucosal non-capsular lesion with a model of diffuse growth and prominent perivascular hyalinization. The sinonasalhemangiopericytoma is usually very enduring. It has an aggressive behavior with a local destructive potential and metastasis. Extended lesions (larger or equal to 6,5 cm) and incomplete initial resections are all associated with a negative prognosis. The treatment is surgical. Local recurrence in 17% up to 40% of the cases takes place most probably due to tumor residues. The prognosis is positive: 5 years without recurrence of the disease has a survival rate of 74.2% and for 10 years the survival rate is of 64.4%. Chemotherapy and radiotherapy can be used in the metastatic stage of the disease or in the case of non-resection or residual primary tumors.

The malignant melanoma

The malignant melanoma is a rare mucosal neoplasm with its origin in the neural tissue and it affects older persons mostly. Typically, it appears in the nose, on the septum or on the lower turbinates and can be associated with the satellite lesions and with regions of an amelanotic tumor. It is a

capricious and unpredictable disease, in which some patients get overwhelmed in just a few months, while others survive years after years with these disease residues. Therefore, the endoscopic surgery is efficient while other more radical procedures and craniofacial surgery are contraindicated. The role of therapy is still under discussion but it could provide a small benefit.

Chondrasarcoma

Appears in the nasal cavity, very often in the septum and it spreads in the skull and the hard palate. It can be multifocal and rather indolent with frequent recurrence along the years.

Although it is often well-differentiated, the term of chondroma should not be used because these tumors eventually cause major problems due to the involvement of the cranial nerve because the disease, in an inexorable manner, spreads along the skull base. Patients of any age can be affected but generally speaking it is more aggressive in the case of young patients mostly because of the mezenchimal variety. Craniofacial resection usually represents the best oncologic approach mostly because these tumors are not radio-sensitive; endoscopic resection is also possible sometimes.

Lymphomas

They represent approximately 6% of the malignant sinonasal tumors and less than 1% of these lymphomas appear in this region. The extranodular lymphomas such as the sinonasal B lymphomas, T cells and NK lymphatic cells present special problems. The B cells tumors have a tough infiltrated mass, which often affect the external region of the nose and soft tissue while the T/NK cell tumors cause aggressive destructive lesions of the middle region of the face, above-mentioned as lethal midline granuloma (and many other terms) and are associated with exposure

to Epstein-Barr. Suspecting such diagnosis and representative tissue sampling is very important because they are often associated with significant inflammation and necrosis. Once diagnosed, a full staging is carried out and the treatment consists of chemo and radiotherapy.

Diagnosis

The orbit symptoms occur in the case of more than 50% of the patients diagnosed with malignant sinonasal tumors, more with ethmoidal tumors (62%) rather than with nasal tumors (42%) and between 60%-80% sinusal malignancies of the maxillary. Iannettiet. al. have identified three stages of orbit invasion:

- 1) Erosion or destruction of the middle orbit wall
- 2) Extraconal invasion of the periorbital fat
- 3) Invasion of the middle rectus muscle, of the optic nerve, of the eye bulb or of the eyelid tegument.

The skull base is an asymptomatic region with very rare cases of cerebrospinal fluid leakage and meningitis; the pain is regular and any personality disturbance associated with the extended infiltration of the frontal lobe is usually too subtle to be noticed. Pain and paraesthesia may occur by involvement of the infraorbital nerve, of the pterygoid region and of the infratemporal fossa which can also produce trismus. The tumor may spread directly into the soft tissues of the face causing the formation of a mass in the cheek that can ulcerate or can extend into the gum fibromucosa, producing another mass and leading to the loss of teeth and/or an oroantral fistula. It is relatively unusual for this type of tumor to present lymphatic or hematogenous metastasis which frequently appear in terminal stages, especially when the disease is not controlled in the location spot.

Both the sinonasal undifferentiated carcinoma (SNUC), the olfactory neuroblastoma and the lymphoma may present nodules in the cervical region. The submandibular, jugulo-diaphragmatic pre-facial and post-facial nodes are usually associated to the septum tumors and mostly to the columellar region, sometimes spreading bilaterally. This invariably determines a negative prognosis. Moreover, the adenoid cystic carcinoma may spread not only along the lymphatic perineural region but it may also produce secondary storage places in the lungs.

1. Imagistics

Computerized tomography (CT) from the axial and sagittal plane mixed with Imagistic Magnetic Resonance (MRI) provides an exact description of the size of the tumor and it sometimes indicates the type of tumor. Initial studies have shown that a combination between these modalities provides an accuracy of 98% in predicting the extension of the tumor. The Imagistic Magnetic Resonance only is not enough because the premature erosion of the cribriform bone is better emphasized by means of computerized coronal tomography. Poorly differentiated tumors such as undifferentiated sinonasal carcinomas, the neuroendocrine carcinomas and lymphomas need a more detailed staging by using CT, MRI or tomography with emission of positrons (PET)-CT. Similarly, the adenoid cystic carcinomas which tend to spread towards the lungs need a thoracic X-Ray and/or Thoracic Computerized

Tomography (CT). In the case of tumors associated with an increased occurrence of cervical metastasis such as olfactory neuroblastomas and undifferentiated sinonasal carcinomas it is recommended to undergo an X-Ray of the cervical region and a Fine Needle Aspiration Biopsy (FNAB).

2.

iopsy

It is generally more adequate to undergo a biopsy under endoscopic control and general anaesthesia because those it is much safer to take representative tissue samples without transgression of the normal tissue in a controlled environment.

SURGICAL PROCEDURES

The best treatment remains undefined; however, most of sinonasal tumors have a surgical approach, often in combination with post-surgery radiotherapy or chemoradiotherapy, which are currently used in the case of most patients with an advanced disease in the location spot; however, some sinonasal tumors such as the lymphomas or undifferentiated sinonasal carcinomas are treated only by means of chemoradiation. Sometimes, this method is used only for relieving pain due to the extension of the tumor at the moment of presentation. Oncologic surgery involves an adequate resection (complete) of the tumor avoiding the normal structures. The block resection of sinonasal tumors, which has been considered a standard treatment for many years, has become more and more well-known due to the development of transfacial approaches (that is lateral rhinotomy and midfacial degloving) and to the combination between transcranial and transfacial approaches for tumors that involve the skull base. However, open approaches are associated with post-surgery morbidity that includes external scars, maxillofacial esthetic flaws caused by osteotomies or by the translocation of the maxillo-facial skeleton; and major injuries caused by brain retraction. Therefore, the alternative minimum-invasive techniques have been introduced gradually in order to avoid or to reduce such complications. Along the last centuries, the endonasal endoscopic techniques have been developed mostly due to an extended informational fund related to endoscopic anatomy and the development of some new surgical methods and technologies made the resection of malignancies with negative borders possible. Endoscopic approaches can be used individually or in combination with a craniotomy if there is a significant dural invasion and/or infiltration of the upper sagittal sinus. The endonasal endoscopic approaches from the skull base include two critical rules: bilateral nasal access which to allow the "two-

surgeons-and-four-hands” technique (that is the bimanual dissection and dynamic movement of the endoscope) and personalized removal of the bone for creating a wide surgical corridor that allows visualization and adequate use of the surgical instruments. A significant advantage of endonasal endoscopic approaches is the fact that they provide the most direct access to the ventral base of the skull, avoiding withdrawal and manipulation of the critical neurovascular structures.

In order to facilitate their understanding and the communication between surgeons, the endonasal endoscopic approaches can be organized according to their anatomic orientation in the sagittal (medial) and coronal plane. The sagittal plane approaches access the ventral base of the skull from the frontal sinus towards the second cervical vertebra; creating an endoscopic corridor for an oncologic resection in the anterior skull base, median naso-pharynx and clivus. The endoscopic approaches in the coronal plan reveal lesions that extend to the lateral side towards the middle line of the orbital platform (anterior coronal approaches), platform of the middle cranial fossa (medial coronal approaches) and the jugular canal (posterior coronal approaches).

Unfortunately, the latest technologies related to the reconstruction that follows the endonasal endoscopic approaches have significantly fallen behind the discoveries of new tumor resection approaches from the skull base. The reconstruction results have been variable until beginning to use the Hadad-Bassagaisteguy flap, which represents a robust flap that can cover a region that extends from the posterior wall of the frontal sinus to the sellaturcica and from orbit to orbit. Other alternative flaps have been subsequently described, being used mostly in the case of patients for whom the nasal-septal flap is not available because of the tumoral invasion or because of a previous surgery. The alternative pedicle flap includes turbinate flap, the transpterygoidtemporoparietal fascia flap, the trans-frontal pericranial flap, the Oliver palatine flap, flaps of the lateral nasal wall. All patients undergo a post-surgery assessment consisting of a thorough examination of the cervico-facial region, the accent falling on the sinonasal region, the orbit, the cervical lymphatic nodules status and on the basic neurological functions (especially the situation of the cranial nerves). Moreover, the sinonasal endoscopy provides a detailed assessment of the sinonasal tract and of the characteristics of the tumor observing any anatomic variation, absence of an active infection, vascularization of the tumor and occasionally, the spot of origin.

The wide spectrum prophylactic pre-surgical antibiotics (third generation cephalosporins with penetration of the cerebrospinal fluid) are administered and the treatment continues in the second post-surgery day (insertion of cotton swabs into the nose may require a longer period for administering the antibiotics). An endoscope rod lens of 0° provides an undistorted and adequate image of the surgical site and allows the use of straight instruments (its visible line matches the instruments' geometry). On the other hand, foveated endoscopic lenses provide an “around the corner” image; however, they are more difficult to use because of their distorted vision and because they need instruments with angles that should match the visible line. Therefore, surgeons prefer to use the endoscope rod lenses of 0° together with a monitor and a high-resolution endoscopic camera for almost all the duration of the operation, maintaining the lenses clean by means of manual irrigation. As mentioned above, the sinonasal tract is a relatively asymptomatic region which means that the symptoms are almost unnoticeable or even absent by the time the tumor reaches a significant size; therefore, most patients present to the doctor with advanced stages of carcinomas which most often include the skull base or extend laterally towards the infratemporal fossa. The endonasal endoscopic approach is focused on the target lesions by means of modular methods anatomically oriented in a sagittal or coronal plane. However, the purely endoscopic endonasal approaches for malignant tumors are limited by the critical paramedian neurovascular structures (that is, the orbit, the optic nerve, ICA); therefore, extension beyond such lateral limits represents a contraindication in the case of an endonasal endoscopy (or shows the necessity of a secondary external approach). Other similar contraindications include a lateral extension of the tumor along the median-orbital plane, invasion of the soft orbital tissues (that is, the necessity of an orbital eventration), involvement of the anterior surface of the skull or of the lateral cavity of the frontal sinus, the necessity of performing a total maxillectomy or the necessity of removing the tegument due to the tumoral invasion.

On the other hand, in the case of a sinonasal active infection with fungi or bacteria it is not necessary to carry out a transduralendonasal endoscopy; therefore, it should be treated before the operation. The purpose of the surgery is to completely excise the tumor with negative margins. However, unlike the open traditional approaches, the endonasal endoscopic resection of a malignity is extremely rarely performed in block. Nowadays,

many authors refer to the resection of sinonasal malignancies by means of endonasal endoscopic surgery, resection carried out piece by piece or layer by layer without compromising the oncologic results.

The most important approaches for sinonasal malignancies are:

1. Endonasal endoscopic resection of the anterior region of the skull base

The sinonasal carcinomas (e.g. squamous cell carcinomas, melanomas, basocellular carcinomas, the adenoid cystic carcinomas and the mucoepidermoid carcinomas) are the most common malignancies that involve the anterior region of the skull (e.g. esthesioneuroblastoma, neuroendocrin carcinoma, the undifferentiated sinonasal carcinoma, primitive neuroectodermal tumors). The lymphoreticular tumors and sarcomas (e.g. lymphomas, plasmacytomas, chondrosarcoma, osteosarcoma, rhabdomyosarcoma, malignant hemangiopericytoma and giant cell malignant tumors) can also occur although not so often. Many of these tumors represent medial lesions that can be approached by means of endonasal endoscopy. However, as mentioned above, the purely endonasal endoscopy has some important limits.

A traditional open craniofacial resection or by means of endoscopy should be taken into account when the tumor spreads beyond the limits that allow an endoscopic resection. However, if resection cannot be performed on the tumor, a purely endonasal endoscopy may have a palliative role in order to open the sinonasal airways, to provide a paranasal sinus drainage for keeping hemorrhage under control or for decompressing the orbit or other neuter structures. This operation generally starts with a surgical reduction of the tumor in order to define its origin spot as well as its connection to the skull base or to other critical anatomic areas.

An ipsilateral middle turbinectomy allows a better penetration of the surgical instruments and provides a more accurate assessment of the tumor. If the tumor involves the bilateral nasal cavity, both medial turbinates are removed. A wide sphenoidotomy and a nasoantral orifice allow identification of the skull base (that is the sphenoid sinus platform) and lamina papyracea. Certain selected cases require bilateral ethmoidectomy which exposes the upper aspect of the nasal cavity and attachment of the turbinates and septum to the anterior skull base up to identification of the nasofrontal cavity for performing a Draf II (for a unilateral resection) or Draf III (for a bilateral resection). Subsequently, the surgical operation continues with reconstruction of the flaw by using the

collagen matrix foil inserted or broad fascia. Then the Hadad-Bassagaisteguy flap is reestablished and situated above the flaw. Occasionally, a fat graft is inserted before positioning the flap; this measure obliterates the blank space (that is the sphenoid sinus); therefore, improving position of the flap and increasing the anterior surface of action. In the end, reconstruction is supported by cotton swabs introduced into the nose. In the case of patients for whom the Hadad-Bassagaisteguy flap is not available (because of the tumor that has invaded the nasal septum, the sphenoidal rostrum or the pterygopalatine fossa or because of a previous resection of the septum) a pericranial flap should be taken into consideration after the planned coronal incision.

1. Transpterygoidendonasal endoscopic extension

Tumors involving the naso-pharynx, the infratemporal fossa (ITF) or the pterygopalatina (PPF), need a resection performed through a transpterygoid corridor. The first steps of the method are usually made through the nostril mostly involved. An ipsilateralethmoidectomy, widesphenoidotomy and medial maxillectomy create a corridor "with just one room" that allows unhindered lateral visualization and instrumentation. However, aggressive tumors that invade the pterygoid muscles are best handled by means of an open approach that allows eventration of the infratemporal fossa.

2. Endoscopic nasal-pharyngectomy

Surgery in the case of primary nasopharyngeal carcinoma has a limited role and radiotherapy is the basic element for the treatment. The operation often has the role of providing tissue samples or of soothing the compressive symptoms. However, the latest research in the field shows the fact that surgery has a major role in approaching glandular carcinoma or in the case of recurrent persistent or loco-regional diseases. Surgical resection is one of the numerous options that are acceptable out of a modern variety of re-irradiation techniques, including stereotactic brachytherapy, protons or modulated intensity therapy. Moreover, surgery has a primary role in the treatment of radioresistant tumors such as adenocarcinomas, adenoid cystic carcinoma, mucoepidermoid carcinomas and sarcomas. Endonasal endoscopic nasal-pharyngectomy is a challenging operation. The transpterygoid approaches provide an exposure to all the lateral sub-regions of the nasopharynx including the infratemporal fossa. However, the ICA parapharyngeal shuttering or extension of the tumor posteriorly to ICA (the parapharyngeal segments or petrous) is considered a contraindication for performing an endoscopic resection with curative purpose. Such extensions

require an open approach like the subtemporal, preauricular or auricular approaches.

3. Trans-clival endoscopic resection

The malignant tumors that invade or have their origin in the clivus are rare but they are usually aggressive and locally destructive (that is chordomas or chondrosarcomas). Radical resection and post-surgery radiotherapy represent standard modalities of treatment. However, surgical approaches of the clivus are challenging and difficult due to the complicated anatomy and deeply-rooted with abundant adjacent critical neurovascular structures. The transclivalendonasal endoscopic approaches provide the most direct route towards the medial, ventral or posterior fossa without retraction of the brain. From a rostral point of view, these can access the retrosellar space extending towards the interpeduncular fossa (by means of a pituitary transposition); on the other hand, from a caudal point of view, they can efficiently expand towards the C25 level. The lateral exposure can be expanded by incorporating a transpterygoid corridor. If there is an endonasal access way that does not provide an adequate lateral access space, resection of the tumor may be staged by using an external lateral approach for any kind of residue tumor. Generally speaking the main principle for resection is to avoid crossing the nerves; thus, EEA is the best approach for accessing tumors situated in a ventral position to the skull nerves. A significant dorsal extension needs an alternative approach (auxiliary). Other limitations include a significant lateral extension towards the cavernous sinus or the paraclive carotid artery or a marked posto-lateral extension which wraps the vertebral or basilar arteries or invades the cerebral trunk.

During the early post-surgery period, after the endoscopic operation of the sinus, two common post-surgery problems may emerge, including the insipid diabetes and the syndrome of abnormal secretion of antidiuretic hormone (SIDAH). Moreover, the physician should pay increased attention to other major complications that may occur after the surgery carried out at the skull base, especially in the case of significant intracranial hemorrhage or pressure in the pneumocephalus. These precocious complications may be identified by means of a post-surgery scanning CT without contrast immediately after the operation (in the case of a stable patient). Many authors also recommend the necessity of an MRI with contrast substance within the first 24 hours after the operation in order to confirm and corroborate ending of the resection. Moreover, ingestion of the contrast substance may provide an image in what concerns the reconstructive flap vascularity and its adequate positioning. However, the main "open

approaches" which the surgeons continue to use for the sinonasal malignancies are:

- Cranio-facial resection

This approach provided, for the first time the possibility of an oncologic resection of the tumor which affects the anterior cranial base and has become thus "the golden standard" for tumors that affect this region. However, it can be considered only as a palliative method in the presence of the involvement of the extended frontal lobe, of the medial cranial fossa, of the bilateral orbit or of the optic chiasm or in the presence of systemic metastasis. It had a special value in the case of adenocarcinoma and olfactory neuroblastoma which mostly appear in this region. The incision is carried out by following the bilateral temporary tarsorrhaphy; an extended lateral rhinotomy is carried out on the side where the biggest part of the tumor is involved. In an alternative way, a coronal flap combined with a mezo-facial degloving or an endoscopic approach has been recommended. The soft tissues of the face are mobilized by means of a periosteal elevation for exposing the nose bones, the frontal processes of the maxillary and frontal bone up, until the hair demarcation line. The major complication is loss of the sense of smell.

- Lateral rhinotomy

This is a fast procedure that provides a good access towards the nasal cavity through which the surgeon may carry out a maxillectomy, frontoethmosphenoidectomy and/or a septum resection. It can be extended both in the upper part for a craniofacial operation that comprises the skull base or in the lower part for a formal maxillectomy if necessary. It is suitable mostly in the case of malignant melanomas or for any other malignancy situated in the nose region or in the region of the adjacent sinuses, and in the case of old people, where a facial scar is of less concern.

- Mezo-facial degloving

The method of degloving may be used independently or in combination with a coronal incision of the scalp for a craniofacial resection or with an endoscope or even microscope which to allow a better image of the site. It provides good access towards the middle third of the face and can be used for certain selected malignant tumors that affect the nasal cavity, the maxillary, the ethmoidbone, the sphenoid bone, pterygopalatine and the infratemporal fossa. It is mostly suitable for condrosarcoma and other malignant tumors which have not reached the anterior skull base yet.

- Maxillectomy

A total traditional maxillectomy by Weber-Fergusson or Weber-Dieffenbach incision can also be used but it

has been replaced with mezo-facial degloving, especially in the case of young patients. It is used for the malignant tumors of the maxillary involving the lower, upper, anterior or posterior wall and it is possible to be necessary to associate it with orbital removal or eventration. A AMPRENTA of the upper alveola should be taken before the operation by a prosthetic orthodontist for a later reconstruction.

- **Total rhinectomy**

The tumors expanded from the nasal cavity will sometimes involve the external nose, having as result the necessity of completely excising the nose. Involvement of the orbit is an element that can predict the survival rate; in the past, if the tumor reached the orbital periosteum, the patient was forced to accept removal of the eye. However, it seems that a more conservatory strategy may be adopted without negatively affecting the result. Therefore, if the tumor eroded the lamina and penetrated the orbital periosteum but did not penetrate the orbital fat, the periosteum may be cut and reconstructed with skin graft or fascia.

In the cases in which the tumor spread through the periosteum and another treatment is not possible, the eye should be sacrificed, but, in most cases, the eyelids can be saved because there is no anterior lymphatic drainage and pre-septum spread is rare. This procedure represents an orbital "cleaning" unlike the orbital eventration when the eyelids are sacrificed. Although lateral rhinotomy, mezzo-facial degloving and maxillectomy have a role in the selected malignancies, the craniofacial resection has considerably improved the result in the case of these tumors that affect the anterior skull base, doubling the survival rate in many cases. In the nasal cavity and in the maxillary and ethmoid sinuses, the prognosis is determined by involvement of the brain, type of histology and involvement of the orbit.

It is important to admit the fact that handling of sinonasal tumors with involvement of the anterior skull base remains multimodal. In fact, despite certain controversy, most patients with sinonasal malignancies are treated by means of a mixed surgical and radiotherapy method. Moreover, the recent use of the "Da Vinci robot" was suggested as an auxiliary method for facilitating the operation of the skull base. It provides a tridimensional view (3D), makes possible an operation at 2-3 hands (robotic arms and those of the co-surgeon/assistant) and it has the advantage of using surgery instruments which provide a better mobility for the hands, improving thus, their ability of handling the tissue (e.g. dural resection or reparation).

However, one should consider the fact that the robot does not have a drill or a drainage

instrument. However, the endonasal endoscopic techniques come to complete the robotic technology, allowing penetration of the skull base and control of the regions that cannot be properly accessed by means of the robotic method.

In the specialty literature, many authors have demonstrated the benefits and quality of life due to the endonasal endoscopic approach. If we compare them with the open methods, the endoscopic approaches cause less post-surgery pain and discomfort and are associated with a shorter duration of the operation and reduced hospitalization period. However, any kind of surgical approach has intrinsic limits which should be taken into consideration. The open techniques present difficulties in visualizing anatomic structures from deeper and less visible regions, including the orbital apex, the frontal cavity, the sphenoid sinus and many others. Lens and fixed rod endoscopy magnifies the image, the peripheral light which is situated away from the central region and visualization (of the surgical target) and offers the opportunity of using angular lenses (0, 30, 45, 70 degrees) for being able to see behind the corner and for examining the structures at deeper levels as compared to the surgical field.

On the other hand, the endoscopic approach offers a mono-ocular image (the in-depth perception is missing); therefore, the neurosurgeons who are used with a binocular vision must develop compensatory maneuvers. The new technologies such as the tridimensional endoscopes (provide a stereoscopic image) and other improvements of the endoscopic optic, the high-resolution cameras and monitors shall eventually eliminate this obstacle. The advantages and disadvantages of tridimensional endoscopy have been mentioned in several studies and its clinical success has also been proven.

DISCUSSIONS

Felisatiet. al. claimed that surgeons must face some precocious difficulties that require adaptation (strain, dizziness, anatomical orientation problems and difficulties in performing surgical maneuvers). Endoscopic approaches seem benefic and advantageous in the case of carefully selected patients; however there is a need for specialized technical expertise and significant experience. The big and strongly invasive tumors such as those with anterior expansion towards the cranial convexity, lateral expansion towards the orbital platform and those tumors that require a total maxillectomy; orbital visceration or removal of the face tegument should be operated by using an open method (an endoscopic method can be used in an auxiliary way). Moreover, an unexpected spread of the tumor during an

endoscopic approach may require conversion towards an open method; thus a team of surgeons who are operating the skull base should be able to perform an assisted endoscopy but open procedures as well, according to the size of the tumor and needs of the patients.

CLINICAL CASE:

Patient A.G., age 58, who presented :

- Respiratory nasal obstruction and hyposmie, the situation worsened along one year; already operated on for a “lobular capillary hemangioma” diagnosis

Endoscopic examination indicated the presence of a grey, soft, vegetative and bleeding lesion in the right nasal cavity (Image 1).



Image.1 : Endoscopic examination

Computerized tomography with contrast substance indicated a bulky mass which developed in the right nasal cavity and in the maxillary sinus, expanding towards the ipsilateralethmoid to the right side of the naso-pharynx. (Image 2).

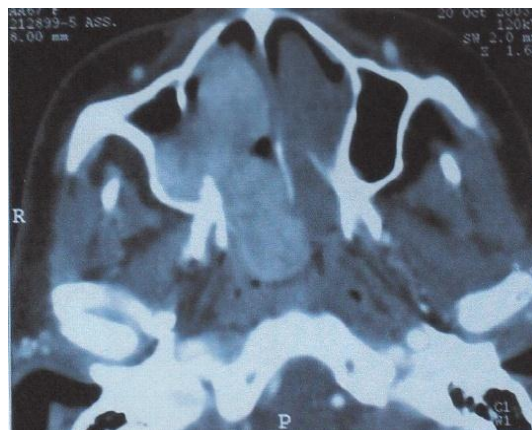
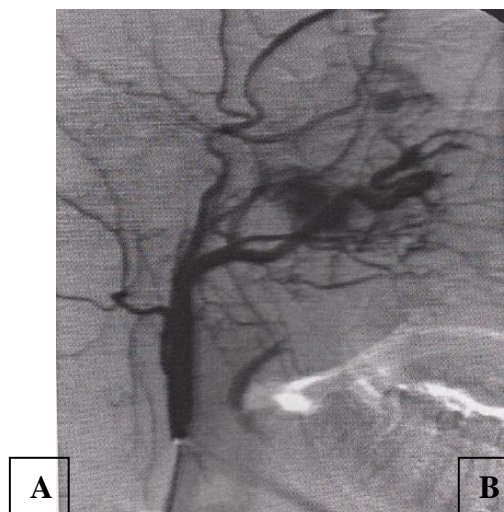


Image.2: CT with contrast substance

Angiography of the carotid circulation showed a significant vascularization of the lesion from the sphenopalatine branches of the right internal maxillary artery. The patient was submitted to embolization of the above-mentioned artery by injecting isobutylcyanoacryl (Image 3). The operation was performed at approximately 48 hours from embolization: by means of endoscopic nasal resection (the right nostril) of the pathological process; it presented as easily separable from the surrounding skeletal planes (Image 4). The intervention did not pose massive bleeding problems and therefore the post-surgery bleeding control was carried out by inserting sterile cotton swabs into the anterior nasal cavities.



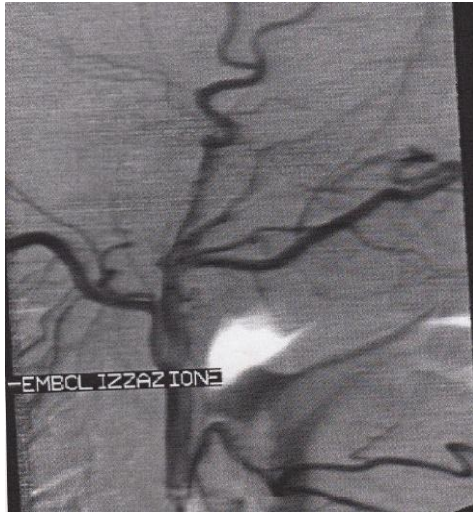


Image.3: A) Angiography of the right carotid circulation indicated a strong vascularization of the lesion from the sphenopalatine branches of the right internal maxillary artery.

B) Embolization



CONCLUSIONS

The 3D endoscopy in diagnosis of the malignant neoplasm it is a modern diagnostic instrument, minimally invasive which help us to put a diagnosis much certain over other classic methods and techniques used currently. The magnification and illumination are other benefits.

BIBLIOGRAPHY

1. Harvey RJ, Sheahan PO, Schlosser RJ. Inferior turbinate pedicle flap for endoscopic skull base defect repair. *Am J Rhinol Allergy*. 2009;23(5):522-6. DOI: <http://dx.doi.org/10.2500/ajra.2009.23.3354>
2. Prevedello DM, Barges-Coll J, Fernandez-Miranda JC, Morera V, Jacobson D, Madhok R, et al. Middle turbinate flap for skull base reconstruction: cadaveric feasibility study. *Laryngoscope*. 2009;119(11):2094-8. PMID: 19718761 DOI: <http://dx.doi.org/10.1002/lary.20226>
3. Fortes FS, Carrau RL, Snyderman CH, Kassam A, Prevedello D, Vescan A, et al. Transpterygoid transposition of a temporoparietal fascia flap: a new method for skull base reconstruction after endoscopic expanded endonasal approaches. *Laryngoscope*. 2007;117(6):970-6. PMID: 17417106 DOI: <http://dx.doi.org/10.1097/MLG.0b013e3180471482>
4. Patel MR, Shah RN, Snyderman CH, Carrau RL, Germanwala AV, Kassam AB, et al. Pericranial flap for endoscopic anterior skull-base reconstruction: clinical outcomes and radioanatomic analysis of preoperative planning. *Neurosurgery*. 2010;66(3):506-12.
5. Oliver CL, Hackman TG, Carrau RL, Snyderman CH, Kassam AB, Prevedello DM, et al. Palatal flap modifications allow pedicled reconstruction of the skull base. *Laryngoscope*. 2008;118(12):2102-6. PMID: 19029856 DOI: <http://dx.doi.org/10.1097/MLG.0b013e318184e719>
6. Rivera-Serrano CM, Bassagaisteguy LH, Hadad G, Carrau RL, Kelly D, Prevedello DM, et al. Posterior pedicle lateral nasal wall flap: new reconstructive technique for large defects of the skull base. *Am J Rhinol Allergy*. 2011;25(6):e212-6.
7. Hadad G, Rivera-Serrano CM, Bassagaisteguy LH, Carrau RL, Fernandez-Miranda J, Prevedello DM, et al. Anterior pedicle lateral nasal wall flap: a novel technique for the reconstruction of anterior skull base defects. *Laryngoscope*. 2011;121(8):1606-10. PMID: 21792948 DOI: <http://dx.doi.org/10.1002/lary.21889>
8. Hall ND, Fabinyi G, Gul SM, Cher L, Leisch NJ. Spinal drop metastasis from grade I skull base chondrosarcoma. *J Clin Neurosci*. 2010;17(1):135-7. DOI: <http://dx.doi.org/10.1016/j.jocn.2009.02.033>
9. Kasemsiri P, Carrau RL, Prevedello DM, DitzelFilho LF, de Lara D, Otto BA, et al. Indications and limitations of endoscopic skull base surgery. *Future Neurol*.

- 2012;7(3):263-77. DOI: <http://dx.doi.org/10.2217/fnl.12.22>
10. Ong YK, Solares CA, Carrau RL, Snyderman CH. New developments in transnasal endoscopic surgery for malignancies of the sinonasal tract and adjacent skull base. *Curr Opin Otolaryngol Head Neck Surg.* 2010;18(2):107-13.
 11. Chen MK, Lai JC, Chang CC, Liu MT. Minimally invasive endoscopic nasopharyngectomy in the treatment of recurrent T1-2a nasopharyngeal carcinoma. *Laryngoscope.* 2007;117(5):894-6. PMID: 17473691 DOI: <http://dx.doi.org/10.1097/MLG.0b013e3180381644>
 12. Ozer E, Durmus K, Carrau RL, de Lara D, DitzelFilho LF, Prevedello DM, et al. Applications of transoral, transcervical, transnasal, and transpalatal corridors for Robotic surgery of the skull base. *Laryngoscope.* 2013;123(9):2176-9. DOI: <http://dx.doi.org/10.1002/lary.24034>
 13. Schneider JS, Burgner J, Webster RJ 3rd, Russell PT 3rd. Robotic surgery for the sinuses and skull base: what are the possibilities and what are the obstacles? *Curr Opin Otolaryngol Head Neck Surg.* 2013;21(1):11-6.
 14. Casler JD, Doolittle AM, Mair EA. Endoscopic surgery of the anterior skull base. *Laryngoscope.* 2005;115(1):16-24. PMID: 15630358 DOI: <http://dx.doi.org/10.1097/01.mlg.0000150681.68355.85>
 15. Felisati G, Pipolo C, Maccari A, Cardia A, Revay M, Lasio GB. Transnasal 3D endoscopic skull base surgery: questionnaire-based analysis of the learning curve in 52 procedures. *Eur Arch Otorhinolaryngol.* 2013;270(8):2249-53. DOI: <http://dx.doi.org/10.1007/s00405-012-2328-5>
 16. American Cancer Society (2007). *Cancer Facts and Figures 2007.* American Cancer Society: Atlanta.
 17. Arellano-Garcia ME, Hu S, Wang J, Henson B, Zhou H, Chia D, Wong DT (2008). Multiplexed immunobead-based assay for detection of oral cancer protein biomarkers in saliva. *Oral Diseases,* 14:705–712.