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The Position of Embolisation in ENT: A Review

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ABSTRACT:

Background: Rosch et al.1 pioneered the use of therapeutic embolisation in the management of acute gastrointestinal bleeding in 1972, and it has since become standard practise. treatment of numerous clinical diseases. Kingsley and O'Connor published a review on embolisation in otolaryngology in 1982, highlighting its application in the treatment of acute bleeding, vascular tumours, and angiomatous deformities.

Objectives: The purpose of this article is to offer an update on the expanding use of embolisation in the practise of otolaryngology.

Methods & Materials: In November 2008, a literature search was carried out. The databases Medline, Embase, PubMed, and Cochrane were searched. This yielded 285 relevant publications for review.

Conclusion: The use of embolisation has significantly increased to cover the treatment of refractory epistaxis, the pre-operative preparation of vascular tumours, vascular traumas, and as an adjuvant in skull base surgery.

Keywords: Radiology, Interventional; Angiography; Epistaxis; Angiofibroma; Paragangliomas

INTRODUCTION:

Rosch et al.[1] pioneered the use of therapeutic embolisation in the management of acute gastrointestinal bleeding in 1972, and it has since become standard practice treatment of numerous clinical diseases.Kingsley and O'Connor published a review of embolisation in otolaryngology in 1982, highlighting its use in the treatment of acute bleeding, vascular tumours, and angiomatous deformities.[2]

This study aims to offer an update on the use of embolisation in the management of otorhinolaryngological disorders (for our search approach, see Appendix 1).Epistaxis In 1974, Sokoloff et al. successfully employed embolisation to treat refractory epistaxis for the

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first time. [3] The development of local regimens for epistaxis care has resulted in control in 95% of patients. [4] Angiographic embolisation is appropriate if sphenopalatine artery ligation fails or the patient is unfit for general anaesthesia. Included among the embolic materials are polyvinyl alcohol particles, microcoils, and Gelfoam® torpedoes.[5] The success rate ranges from 71% to 100%.[6]

External carotid artery ligation is should be avoided since it avoids further embolization. Angiography typically reveals a supply from big collaterals of the greater palatine artery and infraorbital branches of the internal maxillary artery, and it is rare to identify other aberrant arteries.

Pre-surgical embolisation

Although direct percutaneous injection of an embolic agent into the tumour may be performed, pre-operative tumour embolisation is conducted using an endovascular technique. Indications for embolisation include the management of surgically inaccessible feeding vessels, which lowers blood loss and damage to neighbouring tissues and permits better surveillance of the operative field, hence lowering the risk of surgical complications. [7]

Nasopharyngeal angiofibroma in children

During surgery, these tumours have the potential to produce life-threatening bleeding. Recurrence is associated with insufficient excision. Angiography enables pre-operative embolisation of the feeding arteries, which reduces intraoperative blood loss by 60%. 24-72 hours before resection, embolisation is conducted. However, the internal carotid artery can potentially contribute to big tumours via the vidian and middle meningeal arteries. [8]

Tumour haemorrhage

This occurs commonly in patients with ulcerative tumours due to malignancy-induced vascular erosion. Initial administration is conservative, with a focus on packing, although transarterial embolisation has been successfully utilised.[13] Surgical treatment can be challenging due to fistulae and radiation-induced necrosis, and is accompanied by a high mortality and complication rate. Surgical ligation can leave the patient susceptible to rebleeding from a collateral circulation, altering the vascular anatomy and making endovascular therapy more challenging.[14] Emergency closure of the internal or common carotid artery is associated with a 9–100% mortality rate and 16–100% incidence of neurological sequelae.

Arterial embolisation is an efficient, safe, and rapid approach for decreasing tumour haemorrhage.[15] It has been observed that transarterial embolisation has a success rate of 92%14 and produces an average post-haemorrhage survival of 26 days, compared to 8 days in patients having angiography alone.[13]

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It is believed that the hemostatic impact of embolisation lasts longer than that of ligation because embolic materials might reach peripheral arteries.[14,16] Even if re-bleeding occurs, repeated embolisation is relatively straightforward to perform.The recurrence rate of haemorrhage following embolisation ranges from 0% to 33%.[14] The proper timing and application of transarterial embolisation is challenging in patients who are hemodynamically unstable as a result of significant bleeding, and the procedure has a high death rate in such patients. In patients with modest bleeding, it might be difficult to determine the source of the bleeding, and radiologists may be reluctant to employ transarterial embolisation if there is no definitive source.

Palliative embolisation

It has been reported that palliative embolisation is used to manage bleeding caused by terminal head and neck malignancies. Because the oropharynx is the source of the majority of bleeding, local packing is generally problematic and painful. Alternative treatments include carotid artery ligation, despite its high death and morbidity rates.

Pharyngocutaneous fistulae or tumours may make carotid system external access problematic. Transarterial embolisation is favoured over open procedures due to its safety and efficacy, with low rates of complications and good survival rates. [17]

Paraganglioma

Shick et al. published the first successful report of carotid body tumour embolization in 1983.[18] The use of pre-operative embolisation has been demonstrated to dramatically reduce blood loss. In the palliative care of these tumours, direct puncture therapeutic embolisation may be considered.[19] In cases of carotid body tumour removal, mean blood replacements of 2.1 and 4 units have been observed in the absence of pre-operative embolisation, compared to 200 ml when pre-operative embolisation is utilised. This operation can also reduce the size of the tumour by up to 25%, which is a significant factor because cranial nerves are easier to find and preserve, and it is therefore uncommon to have to clamp or resect the internal or external carotid artery. [10] For tumours greater than 2 centimetres, preoperative embolisation has been urged, and the operational surgery should be conducted within 48 hours of embolisation.

Carotid blow-out syndrome

Life-threatening is a rupture of the extracranial carotid arteries or their major branches. [12] Carotid blow-out syndrome is a pre-mortem condition requiring immediate surgical intervention. Due to the patient's deteriorating health, ligation may be unsuitable.[13] The surgical care of previously irradiated or diseased fields is complicated.

The mortality and significant neurological morbidity rates for emergency closure of the internal or common carotid artery range from 9 to 100 percent.[14,15] Recent advances in the

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use of covered stents have reduced morbidity rates to 0–8% and fatality rates to 0%, however the long-term consequences have not yet been confirmed.[14] When the internal, common, or proximal external carotid artery trunk is implicated, blockage using removable balloons is the optimal method. Branches of the external carotid artery are best handled via superselective embolisation so that branches adjacent to the afflicted artery are maintained, hence lowering the likelihood of ischaemia involving the face and neck and the possibility of cranial nerve function impairment.

Trauma

Severe craniofacial trauma may result in substantial oronasal haemorrhage. The anticipated location and lateralisation of bleeding are frequently erroneous; hence, they should not be relied upon.Angiograms of both the internal and exterior carotid arteries are beneficial.[18]

In situations of bleeding from the ethmoid artery, embolization would occur via the ophthalmic artery, which offers an unacceptable risk of blindness due to obstruction of the retinal and posterior ciliary branches; surgical clipping is therefore recommended.

Numerous asymptomatic individuals have major vascular injuries, and zone I or zone III damage may necessitate extensive surgical treatment. Due to the fact that delayed care of vascular and aerodigestive tract injuries is associated with a high morbidity rate, there is now a dispute regarding the benefits of required neck exploration vs the use of angiography and embolisation. A study determined that interventional surgery was unneeded for up to 63% of patients. [19] In contrast, it has been found that the incidence of missing injuries in patients with a normal first angiography is less than 2%. [20]

Transarterial embolisation can be used to provide definitive control of haemorrhage, particularly in situations of zone III trauma where haemorrhage can be difficult to access surgically. However, Golueke found no difference in length of stay, morbidity, and death between surgical exploration and selected management.[19] Due to their safety and dependability, cervical angiography and transarterial embolisation have been proposed for widespread usage in situations of penetrating neck injuries.[19] When open access is not regarded essential, therapeutic embolisation should be considered a potential technique of treatment for arterial neck injuries.

Arteriovenous malformation

When needed, angiography and selective embolisation are typically performed prior to surgical excision of arteriovenous malformations to limit the risk of complications to determine the vascularity of the lesion and the feeder arteries. This facilitates long-term recovery, as partial excision results in recurrence. Embolisation has been demonstrated to reduce operative blood loss, lesion size, and surgical excision extent. 34 Due to the possibility of rapid growth between embolisation and resection, the duration between surgeries should be between 24 and 48 hours. [15] Embolisation alone is appropriate for the

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treatment of external carotid artery arteriovenous malformations if the lesion is deemed inoperable and surgical excision would increase morbidity, or if the patient is medically unfit for surgery.[14]

Based on the clinical staging according to the modified Schobinger classification, the recommended indications for embolisation and resection include (1) quiescence, (2) expansion, (3) destruction, and (4) decompensation.[15] Lesions in the first and second stages can be removed and repaired with relative ease.

Painful or rapidly expanding lesions (stages two and three) necessitate prompt intervention due to the high likelihood of progression and the risk of severe bleeding. Intervention for extensive stage one lesions remains controversial for three reasons: (1) the risk of progression cannot be predicted; (2) resection of very extensive stage one lesions is more likely to be incomplete; and (3) the deformity resulting from extensive resection and reconstruction may be worse than the deformity caused by the original lesion. [15,16] In 60% of cases when embolisation was used to treat arteriovenous malformations, it was deemed effective.

Carotid–cavernous fistula

Carotid–cavernous fistulae are characterised by an aberrant anastomosis between the carotid artery and the cavernous sinus. [17] They are capable of spontaneity Collagen vascular disease, fibromuscular disease of the cerebral arteries, or rupture of intracavernous internal carotid artery aneurysms patients.[17,18] Acquired cases are caused by trauma, transsphenoidal surgery, embolisation of a cavernous sinus meningioma, and rhinocerebral mucormycosis.

This syndrome is sometimes accompanied by epistaxis and indications of ocular vein blockage (dilated forehead veins, headache, and elevated intra-orbital pressure). Additionally, patients may experience pulsatile proptosis and visual abnormalities.[18,19]

Angiography is essential for the diagnosis and treatment of carotid–cavernous fistula, according to reviews on the topic. Endovascular embolisation has become a standard approach of treatment. Stenting is also a possibility because it can maintain the patency of the internal carotid artery.

Skull base tumours

When a large section of a skull base tumour is directly supplied by the internal carotid artery, particle irradiation is recommended.It is possible to execute embolisation from within the carotid artery.For big, recurrent tumours that may not be directly supplied by vessels typical of freshly diagnosed tumours, direct percutaneous embolisation may be of assistance.If pre-surgical embolisation of a primary jugular foramen tumour can reduce operative morbidity and blood loss, it should be undertaken.[16] The jugular bulb is opened during skull base surgery involving the region of the jugular foramen. This may result in severe blood loss,

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increased operational time, and the danger of compressive injury to cranial nerves IX, X, and XI due to overpacking. Before surgery, embolisation of feeder arteries to the jugular bulb minimises the likelihood of these problems. There is a theoretical danger of harm to the lower cranial nerves, but it is believed that this risk is smaller than that of surgical packing. [17]

Functional endoscopic sinus surgery

Known complications of endoscopic sinus surgery include bleeding.[13] Iatrogenic injury to the internal carotid artery is uncommon, but angiography and embolisation are lifesaving if it does occur. Pepper and colleagues' guidelines for internal carotid artery bleeding recommend angiographic control (using tamponade balloons) and emergency coil embolisation for the management of bleeding. [18]

Complications

Tseng et al. classify embolisation consequences as either major or minor events.6 Due to tissue necrosis, fever and localised pain are the most typical mild side effects. 2 Minor problems include of facial pain, headaches, mental confusion, paraesthesia, jaw pain, groyne pain, numbness, and facial oedema. Major complications of embolisation include stroke, blindness, ophthalmoplegia, facial nerve palsy, and necrosis of soft tissue.[16]

Accidental embolisation of the internal carotid artery, leading to a CVA, is the most significant risk. General problems, like as sensitivity to the contrast or embolic material, are uncommon. 2 Barlow et al. reported that the incidence of complications for embolisation in epistaxis is comparable to that of arterial ligation, ranging from 13 to 48 percent.[19] A literature study of the success rates and complications associated with embolisation for persistent epistaxis revealed that, of 572 patients embolised for persistent epistaxis, five experienced considerable long-term morbidity (a prevalence of 1%) and two experienced minor long-term morbidity (i.e. facial scarring).The incidence of CVA was less than 1%.[20]

Post-embolization spasm of the accessory meningeal artery may result in ischaemia and hypoesthesia of the third branch of the trigeminal nerve, whereas blockage of the petrosal artery may result in ischaemia and paralysis of the horizontal segment of the facial nerve.[22] An anastomosis between the internal maxillary artery and ophthalmic artery branches may result in vision loss, however pre-operative angiography should reveal a choroidal blush if this is the case.

Among the dangers of embolisation for post-tonsillectomy haemorrhage are artery perforations and subsequent embolic material extravasation;Ischemia of mucosal surfaces and cranial nerves; accidental involvement of the internal carotid artery; catheter-induced vasospasm; and post-procedure discomfort.[24] There is a chance of external carotid artery region vasospasm if hypovolemic and vasoconstrictive medications are employed in the care of trauma patients. [25-26] It is essential to be aware that embolization of these veins can

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result in intracerebral problems due to the reflux of embolic debris into the internal carotid artery.[18]

CONCLUSION:

In numerous facets of otolaryngological practise, embolisation plays a crucial role. It has a long history of use in the treatment of intractable epistaxis being efficient and having minimal rates of complications.

In the majority of centres, pre-operative embolisation of vascular tumours is available. In addition to reducing blood loss, embolisation also increases the visibility of the surgical field, making dissection easier, and shortens the duration of the surgical operation. Embolisation plays an increasingly crucial role in the palliation of advanced head and neck tumours, as well as in the care of their sequelae. In situations of head and neck trauma, bilateral angiography with the goal of embolisation should be explored as a diagnostic and therapeutic intervention, particularly when surgical treatment is being considered.

Embolisation has proven to be an essential adjuvant in the treatment of haemangiomas, arteriovenous malformations, telangiectatic disorders, and post-operative problems. In experienced units, embolisation is a safe, effective, and useful therapeutic adjunct for the care of a wide range of otolaryngological disorders, and might play a significant role in the majority of fields of ENT practise.

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