

Juvenile angiofibroma: major and minor complications of preoperative embolization*

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Summary

Introduction: Juvenile angiofibromas (JA) are highly vascular, benign tumours for which surgery is the treatment of choice. In most services, embolisation is performed prior to resection. Nevertheless, there are few data on the complications of preoperative embolisation for JA.

Aim: To describe major and minor complications of preoperative embolisation in a 32-year experience of patients undergoing surgical resection of JA at a tertiary hospital.

Methods: Retrospective chart review study of 170 patients who underwent surgical resection of JA at a tertiary hospital between September 1976 and July 2008.

Results: All patients were male. Age ranged from 9 to 26 years. Ninety-one patients had no complications after embolisation. Overall, 105 complication events occurred of which four major and 101 minor.

Conclusion: In our series, preoperative embolisation for JA produced no irreversible complications and no aesthetic or functional sequelae. The vast majority of complications were transient and amenable to clinical management.

Key words: angiofibroma, embolisation, complications, preoperative

Introduction

Juvenile angiofibromas (JA) are highly vascular, benign tumours that occur in male adolescents and young adults and usually present as nasal obstruction and epistaxis⁽¹⁾. JAs account for 0.05% of all head and neck tumours⁽²⁾ and may be life-threatening due to the potential risk of bleeding and intracranial invasion⁽³⁾.

Surgery is the treatment of choice for JA⁽⁴⁾. Preoperative evaluation includes CT scan of the paranasal sinuses. MRI is recommended for tumours with intracranial invasion or orbital extension⁽¹⁾. Although there is no consensus, bilateral angiography of the carotid system and preoperative embolisation

are recommended to reduce intraoperative bleeding and facilitate resection, decreasing operative time, risk of recurrence and transfusion requirements^(1,4-12).

The benefit of embolisation should be discussed and weighed against its morbidity. This varies widely and should be adjusted according to the patient, institution and interventional radiology team⁽¹⁾. The most significant complication of this procedure would be migration of an embolus into the intracranial circulation, but this is considered rare. Other complications associated with embolisation include systemic reaction to contrast, infection at the puncture site, femoral hematoma and thrombosis, blindness, facial paralysis, skin necrosis, oronasal

fistula, seizures, fever and facial pain^(1,13-17). Complications of arterial embolisation occur in 17% to 25% of cases and are classified into major or minor. Minor complications include pain or paresthesia, headache and facial edema, which usually resolve within a week. Major complications include stroke, blindness, facial paralysis, septal perforation, and skin or palate ulcers or necrosis, all of which have an incidence of less than 2%^(18,19).

Few studies have described the complications of preoperative embolisation for JA resection⁽²⁰⁾. With this in mind, this paper presents the minor and major complications associated with this procedure in a 32-year series of patients undergoing surgical resection of JA at a tertiary hospital.

Materials and methods

Study design

We conducted a retrospective chart review study of all patients who underwent surgical resection of JA at a tertiary hospital between September 1976 and July 2008. Major complications were defined as those requiring medical intervention or increased length of hospital stay due to embolisation.

Embolisation

In all patients, preoperative trans-arterial embolisation was performed by the Interventional Radiology team of the same institution where resection was to be performed, using 150 to 350-micron PVA particles and Gelfoam macroemboli as the embolic agents. The internal carotid artery or its branches were not embolised in any patients. All procedures were performed under general anaesthesia and, since 1997, used the coaxial micro-catheterization technique, with a large-bore catheter (guide catheter) placed in the external carotid artery and a micro-catheter advanced through it to the distal site for selective, safe injection. The time elapsed between embolisation and surgery ranged from 2 to 144 hours. Patients were sorted according to presence or absence of various complications in the immediate post-embolisation period.

Results

We reviewed the medical records of 170 patients who underwent preoperative embolisation for resection of JA at our service. Two patients underwent preoperative embolisation more than once, due to tumour recurrence requiring reoperation. All patients were male. Age ranged from 9 to 26 years (mean, 13.6 years). Eighteen (10.6%) patients had intracranial tumour invasion.

Ninety-one patients (53.5%) had no complications after embolisation. Of the 79 patients with complications, 25 (14.7%) had more than one complication. A total of 105 complication events occurred: four major - requiring intervention and

Table 1. Major complications of preoperative embolisation.

| Complication | n | Rate |
|--|----------|-------------|
| Common iliac artery thrombosis | 1 | 0.6% |
| Acute pulmonary oedema | 1 | 0.6% |
| Necrosis of the upper pole of the tonsil | 1 | 0.6% |
| Necrosis of the nasal wing | 1 | 0.6% |
| Total | 4 | 2.4% |

Table 2. Minor complications of preoperative embolisation.

| Complication | n | Rate |
|------------------------------------|------------|---------------|
| Sore throat | 22 | 12.9% |
| Hemifacial pain | 17 | 10.0% |
| Nausea and vomiting | 13 | 7.7% |
| Headache | 11 | 6.5% |
| Neck pain | 6 | 3.5% |
| TMJ pain/soreness | 5 | 2.9% |
| Fever | 4 | 2.3% |
| Periorbital pain | 4 | 2.3% |
| Hematoma in the femoral region | 3 | 1.7% |
| Lower limb pain/soreness | 3 | 1.7% |
| Reversible change in visual acuity | 3 | 1.7% |
| Dyspnea | 3 | 1.7% |
| Lip pain | 3 | 1.7% |
| Dysphagia | 2 | 1.2% |
| Hemifacial paraesthesia | 1 | 0.6% |
| Tongue paraesthesia | 1 | 0.6% |
| Total | 101 | 59.4 % |

Table 3. Chronology of post-embolisation (PE) complications.

| Day after embolisation | n (%) |
|--|-------------------|
| 0 (immediately following embolisation) | 11 (10.5%) |
| 1 | 54 (51.4%) |
| 2 | 25 (23.8%) |
| 3 | 5 (4.8%) |
| 4 | 3 (2.8%) |
| 5 | 1 (0.9%) |
| 6 | 2 (1.9%) |
| 8 | 3 (2.8%) |
| 13 | 1 (0.9%) |
| Total | 105 (100%) |

prolonged hospital stay (Table 1) - and 101 minor, requiring no further intervention (Table 2).

Post-embolisation (PE) complications were defined as those diagnosed within 13 days of embolisation (Table 3).

Discussion

In a large review by Christensen ⁽²¹⁾ on management of severe posterior epistaxis by embolisation, a procedure analogous to the embolisation of JA (although they are different populations, the two have already been compared in a previous study ⁽²⁰⁾), the complication rate ranged from 2 to 50% in 23 studies. Of 70 patients with severe posterior epistaxis treated by embolisation by the same author, 24 (34%) had complications: one had a stroke, 13% had major rebleeding, 6% had minor rebleeding and 14% had late rebleeding (over 6 weeks post-procedure). In our study, complications occurred in 46.5% of cases. Although this rate is relatively high compared to others reported in the literature (see Table 4), one must take into account the substantial number of clinical signs and symptoms that were included among the minor complications, most of which were not included in other studies, and the low rate of major complications (2.4%).

Other major complications have been reported in the literature in association with embolisation of the external carotid artery territory: facial paralysis ⁽²³⁾, stroke ⁽²⁴⁾, necrosis of the tip of the tongue ⁽²⁵⁾ and facial atrophy ⁽²⁶⁾. None of these complications occurred in our series.

The following section provides a brief overview of the outcome of patients who developed major complications after preoperative embolisation. We were unable to compare intraoperative bleeding rates, because preoperative embolisation is routinely performed in all patients scheduled for surgical resection of JA at our department.

One patient developed thrombosis of the iliac artery on the 13th postoperative day, and was diagnosed and treated by surgical revascularization on the same day. The patient had no sequelae in the lower limbs. A patient developed acute

pulmonary oedema immediately after embolisation as a result of contrast allergy. The patient required a two-day ICU stay, but underwent successful JA resection 24 hours after discharge from intensive care. The patient with necrosis of the upper pole of the tonsil had very minor throat-related complaints, and the decision was made not to perform concomitant tonsillectomy during JA resection due to slight improvement in the appearance of the tonsil. In another patient, an ulcerated lesion of the nasal wing occurred on the 8th postoperative day and progressed to slight nasal valve collapse, which was corrected 6 months after JA resection.

After proper care, none of the major complications led to any aesthetic or functional sequelae. Minor complications were transient in all cases, and most were successfully controlled with symptomatic treatment alone. Embolisation of the intracranial circulation did not occur in any of the 170 patients.

Some studies have considered preoperative embolisation as a risk factor, with a higher rate of recurrence ⁽²⁷⁻²⁹⁾. However, in our experience, embolisation was effective in reducing the size of the tumour and making its resection easier, thus lowering the recurrence rate.

The general consensus confirms that the reduction of intraoperative bleeding provided by embolisation prior to JA resection ^(30,31), coupled with the low morbidity and exceedingly low mortality reported in this and other samples ^(32,33) and with recent technical advances that have made embolisation even safer and more effective ⁽³⁴⁾, justify the continuation of this practice when entrusted to experienced interventional radiologists.

Conclusion

Preoperative embolisation in patients undergoing resection of juvenile angiofibroma is not devoid of complications. Nevertheless, in our series, it was not associated with any irreversible complications or aesthetic and functional sequelae. The vast majority of the complications that did occur were transient and fully amenable to clinical management.

Table 4. Experience of other services.

| | Christensen et al. (2005) ⁽²¹⁾ | Tseng et al. (1998) ⁽¹⁸⁾ | Moreau et al. (1998) ⁽²²⁾ | Present study |
|---------------------|--|--|---|---------------|
| Site | Maxillary | Maxillary | Maxillary | Maxillary |
| Sample size | 70 | 112 | 45 | 170 |
| Complication rate | 24 (34%) | 19 (17%) | 4 (8%) | 79 (46.5%) |
| Minor complications | 4 (16.6%) | 17 (89.5%) | 1 (25%) | 75 (97.6%) |
| Major complications | 20 (83.3%) | 2 (10.5%) | 3 (75%) | 4 (2.4%) |

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