Intra-Arterial Embolisation in Otolaryngology – *A Four-Year Review*

Y M Low, Y H Goh

ABSTRACT

This is a retrospective review of otolaryngology patients who underwent intra-arterial embolisation in a tertiary hospital over a four-year period.

Thirty patients were reviewed. Seven (23.3%) were embolised electively before resection of hypervascular head and neck tumours. Of the emergency indications, nine patients (30%) had intractable epistaxis from non-oncologic causes, 14 (46.7%) had bleeding of oncologic origin from the head and neck. In all, six patients required further procedures within the first week, 2 (6.7%) suffered permanent cranial nerve deficits.

Our results show that intra-arterial embolisation is both useful and safe in elective and emergency settings in otolaryngology, with complication rates comparable to previous publications. The survival of oncology patients with otherwise fatal haemorrhage was significantly prolonged.

Keywords: Pre-operative embolisation, endovascular treatment, epistaxis, nasopharyngeal carcinoma, carotid rupture

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INTRODUCTION

The role of percutaneous intra-arterial embolisation as a therapeutic modality in the control of intractable epistaxis has been described as early as 1974[1]. Although intra-arterial embolisation is a recognised and valuable tool in the armament of otolaryngologists against life-threatening epistaxis, its application is far wider in the field of otolaryngology. It is not only a useful adjunct in the pre-operative management of hypervascular head and neck tumours, it is also invaluable in the emergency management of massive bleeding from the head and neck region.

This is a retrospective review of patients admitted to the Department of Otolaryngology in Singapore General Hospital, a tertiary referral hospital, who underwent intra-arterial embolisation over a four-year period from January 1998 to December 2001.

MATERIALS AND METHODS

From procedure room records of the Department of Diagnostic Radiology in Singapore General Hospital, 30 patients from the Department of Otolaryngology underwent intra-arterial embolisation during the period of review from 1 January 1998 to 31 December 2001.

The medical records of these 30 patients were reviewed and the following data were collected:

1. Demographics
2. Indication for embolisation
3. Any previous embolisation
4. Presence of re-bleeding/ Need for further embolisation or other procedure
5. Survival outcome

For patients with cancer where the "alive/dead" status was not known (for example, those discharged to hospice), the date and cause of death was obtained from the Singapore Cancer Registry.

RESULTS

Of the 30 patients reviewed, 7 (23.3%) underwent intra-arterial embolisation as an elective procedure prior to head and neck surgery, and 23 (76.7%) were emergency procedures for intractable bleeding from the head and neck. Of the emergency cases, 9 (39.1%) were for intractable epistaxis of non-oncologic causes. The remaining 14 (56.5%) patients had some form of head and neck malignancy, 11 (47.8%) of whom were cases of epistaxis from nasopharyngeal carcinoma (NPC). Over the period of this study, a total of 266 patients were admitted to our centre for management of epistaxis. Of these only 21 (7.9%) underwent intra-arterial embolisation to control the bleeding.

The mean age of the entire cohort was 44 years, the youngest patient being 13 years and the oldest 74 years. There were 24 (80%) males and 6 (20%) females.

Elective embolisation (n = 7, 23.3%)

Of the elective procedures, four patients had carotid body tumours, two had nasopharyngeal angiofibroma and one had a nasal haemangioma (Table I). All

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underwent diagnostic angiography prior to intra-arterial embolisation of feeding vessels. There were no complications secondary to the procedures. All underwent elective excision of their tumours within 24 hours of embolisation and subsequently discharged well.

Emergency embolisation for non-oncologic epistaxis (n = 9, 30%)

All nine patients who underwent emergency intra-arterial embolisation for non-oncological causes suffered from epistaxis which was refractory to conservative measures in the ward. Of these, 4 (44.4%) patients had concurrent hypertension. One patient had a congenital platelet dysfunction resulting in intractable epistaxis after manipulation and reduction of a nasal bone fracture (Table II).

Two patients had undergone intra-arterial embolisation two years before for epistaxis. Both patients re-bled after the second procedure. The first re-bled seven days after embolisation and required examination under anaesthesia with diathermy of the bleeding spot. The second patient re-bled the same day and had nasal packing done. He underwent repeat embolisation three days later. However, he bled again two days after but the bleeding was stopped with conservative measures. He continued to have minor bleeds every few months not requiring medical intervention, and was discharged from follow-up after one year. The other eight patients did not suffer any complications from the procedure and were subsequently discharged after a mean follow-up of eight months (range one to 13 months). One patient died two years later from intracranial haemorrhage secondary to an aneurysm of the internal carotid artery. This had been picked up on the pre-embolisation carotid angiogram but was treated conservatively by the neurosurgeon.

Table I. Elective Embolisation.

Case No.	Sex	Age	Diagnosis
1	M	14	Nasopharyngeal angiofibroma
2	M	27	Nasal haemangioma
3	F	32	Carotid body tumour
4	M	13	Nasopharyngeal angiofibroma
5	F	28	Carotid body tumour
6	F	29	Carotid body tumour
7	M	58	Carotid body tumour

Emergency embolisation for oncologic bleeding (n = 14, 46.7%)

Eleven patients underwent intra-arterial embolisation for epistaxis after irradiation for NPC (Table III). Two had previously undergone embolisation for epistaxis.

Four patients re-bled within the first three days. Of these, three required repeat re-embolisation and one underwent haemostasis under anaesthesia during the same admission.

Of the original cohort of 11 patients, only one was still alive at the time of data collection. Another was a foreigner who returned to her home country in a critical state – her survival time is unknown. Of the nine patients who died, the mean survival after embolisation was 225 days. The shortest survival was three days after embolisation, the longest 553 days.

Three patients underwent intra-arterial embolisation for oncological causes other than NPC (Table IV). One presented with intractable epistaxis from metastatic renal cell carcinoma to the ethmoid sinus. He survived for 690 days after embolisation. The other two patients suffered unilateral carotid artery blowouts from recurrent head and neck cancers.

Table II. Non-Cancer Bleeders.

Case	Sex	Age	Diagnosis	Outcome
1	M	29	Epistaxis	Well
2	M	66	Epistaxis, hypertension	Well
3	M	65	Epistaxis	Well
4	M	74	Epistaxis, hypertension	Incidental ICAA, died from ICH two years later
5*	F	21	Epistaxis	Re-bled seven days later, required EUA
6*	M	53	Epistaxis, hypertension	Re-bled same day, required re-embolisation Infrequent minor bleeds
7	M	20	Epistaxis post-M&R nose, platelet dysfunction	Well
8	M	44	Epistaxis, hypertension	Well
9	M	29	Epistaxis	Well

* Previous embolisation two years before, ICAA: internal carotid artery aneurysm, ICH: intracranial haemorrhage, EUA: examination under anaesthesia, M&R: manipulation and reduction

Table III. NPC bleeders.

Case	Sex	Age	Days to Re-Bleed	Further Procedure	Survival Days
1	M	41	37		220
2	M	44	41 27	Re-embolisation three months later	 45
3	M	41	*		132
4	F	45	0 3	Re-embolisation four days later EUA	 Unknown
5	M	49	120		540
6	M	52	*		277
7	F	50	*		Alive
8	M	57	*		198
9	M	52	0 3	Re-embolisation one day later	 3
10	M	48	40		60
11	M	57	NA		553

NPC: nasopharyngeal carcinoma, EUA: examination under anaesthesia, * no further bleeds

Table IV. Non-NPC Cancer Bleeders.

Case	Sex	Age	Diagnosis	Days survived
1	M	46	Epistaxis, met RCC to ethmoid sinus	690
2	M	62	Carotid blowout	68
3	M	71	Carotid blowout	128

NPC: nasopharyngeal carcinoma, Met RCC: metastatic renal cell carcinoma

Emergency embolisation was carried out successfully. They survived for 68 and 128 days respectively and died from non-haemorrhagic causes.

The complication rate was 21% in this oncologic group; all three patients had NPC. One patient suffered transient drowsiness for two days. Two had permanent neurologic deficits (superior oblique muscle palsy and dysphagia respectively).

DISCUSSION

Percutaneous intra-arterial embolisation is an interventional radiological procedure that has found uses in all fields of medicine. It involves the introduction of embolic materials into feeding vessels of a target lesion via a micro-catheter, and is usually performed under angiographic guidance.

This paper aims to give a broad picture of the various uses of intra-arterial embolisation in the Otolaryngology department of a tertiary referral hospital in Singapore. With a bed-complement of 1,400, Singapore General Hospital is the largest acute care hospital in Singapore, making up one-third of all acute beds in the public sector.

Twenty-three percent of the cohort underwent intra-arterial embolisation pre-operatively. Pre-operative embolisations may be indicated to control surgically inaccessible arterial feeders, reduce surgical blood loss, shorten the surgical procedure time, and increase the probability of total lesion resection. It is typically considered appropriate in cases of hypervascular tumours and vascular malformation, particularly in the head and neck region where surgical access may be difficult. In a series of 10 patients who underwent surgical excision of nasopharyngeal angiofibroma, it was found that pre-operative embolisation reduced intra-operative blood loss by an average of 1L as compared to non-embolised patients, and transfusions were reduced by an average of 4.4 units[2]. This translated to better surgical results. Similar advantages have been reported for paragangliomas[3] and vascular malformations[4] in the head and neck region.

One-third of the cohort underwent intra-arterial embolisation for non-oncological intractable epistaxis. Both immediate success rate and long-term success rate (for the duration of follow-up after the first week) in our study was 89%. In several larger series, immediate success rates of 88-97%[5-7] and long-term success rates of 82-94.6%[6-8] were obtained. Despite a small sample size, our results are comparable to those of other centres.

It is interesting to note that the same two patients who re-bled after the procedure had previously undergone embolisation for similar epistaxis and had concurrent hypertension. Romagnoli et al reported that pre-embolisation angiography of all

13 patients in their series showed the presence of submucosal telangiectasia at the site of the epistaxis[9]. They postulated that in the presence of triggering factors (hypertension, pregnancy), untreatable epistaxis is sustained by a submucosal vascular malformation. This could explain the propensity of certain patients to re-bleed after embolisation and merits further study.

NPC is endemic in South Asian Chinese and is one of the most common malignancies encountered in our otolaryngology practice. Radiotherapy is the definitive treatment for NPC and its regional node metastases. One of the most frightening complications in patients who had undergone irradiation for NPC is epistaxis, as it is often brisk and difficult to control by conventional methods. The use of intra-arterial embolisation in this context has been described by Mok et al from Hong Kong[10]. Eight patients were successfully embolised over a four-year period and no significant complications were reported. Recurrent epistaxis occurred in three patients, one required two further embolisations. As shown in our series, intra-arterial embolisation is a highly effective tool in abolishing catastrophic epistaxis and significantly prolonging patients' survival.

Carotid rupture or blowout is one of the most-feared complications of head and neck cancers. Published mortality rates of 9-100% have been reported, with major neurological complication rates of 16-100%[11]. With the advent of endovascular techniques, the prolongation of our patients' survival, many of whom are at the brink of dying from a catastrophic bleed, can be achieved with very low morbidity. The largest published series on this topic[11] reported no mortalities or major neurological sequelae. Our experience compares well with these figures.

CONCLUSION

The use of intra-arterial embolisation in otolaryngology practice is not limited to the management of epistaxis alone. It is a useful adjunct prior to elective excision of hypervascular tumours in the head and neck region. Good results can be obtained in the emergency management of epistaxis of both oncological and non-oncological causes. Survival of patients with advanced head and neck malignancies who would otherwise have died from haemorrhage was significantly prolonged.

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