



A Case Series: Pre-operative Internal Maxillary Artery Embolization Before Temporomandibular Joint Reconstruction

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Background

Temporomandibular joint (TMJ) ankylosis is an often disfiguring pathology causing significant reduction in mandibular mobility leading to disability in mastication, digestion, speech, and oral hygiene. Caused by trauma, radiation, infection, and iatrogenic injury, TMJ ankylosis requires complete excision of the ankylosing mass following by arthroplasty. During this procedure, substantial hemorrhage up to 3.7L resulting from injury to the internal maxillary artery (IMA) as it courses around the ankylosing mass may occur. Our goal is to demonstrate the advantage to preoperative bilateral IMA embolization in TMJ replacement.

Methods

A case series using chart reviews of 2 patients who underwent preoperative IMA embolization before TMJ ankylosis surgery between October 2016 and June 2017.

Results

Patient 1: 25 year old female with previous trauma causing bilateral condylar fractures requiring an open reduction with internal fixation and closed reduction with maxillomandibular fixation. She developed worsening trismus with pain on maximal opening secondary to ankylosis of temporomandibular joint (Fig. 1). Initial maximal opening was 10mm. She was scheduled for pre-operative internal maxillary artery embolization prior to temporomandibular joint reconstruction (Fig 2).

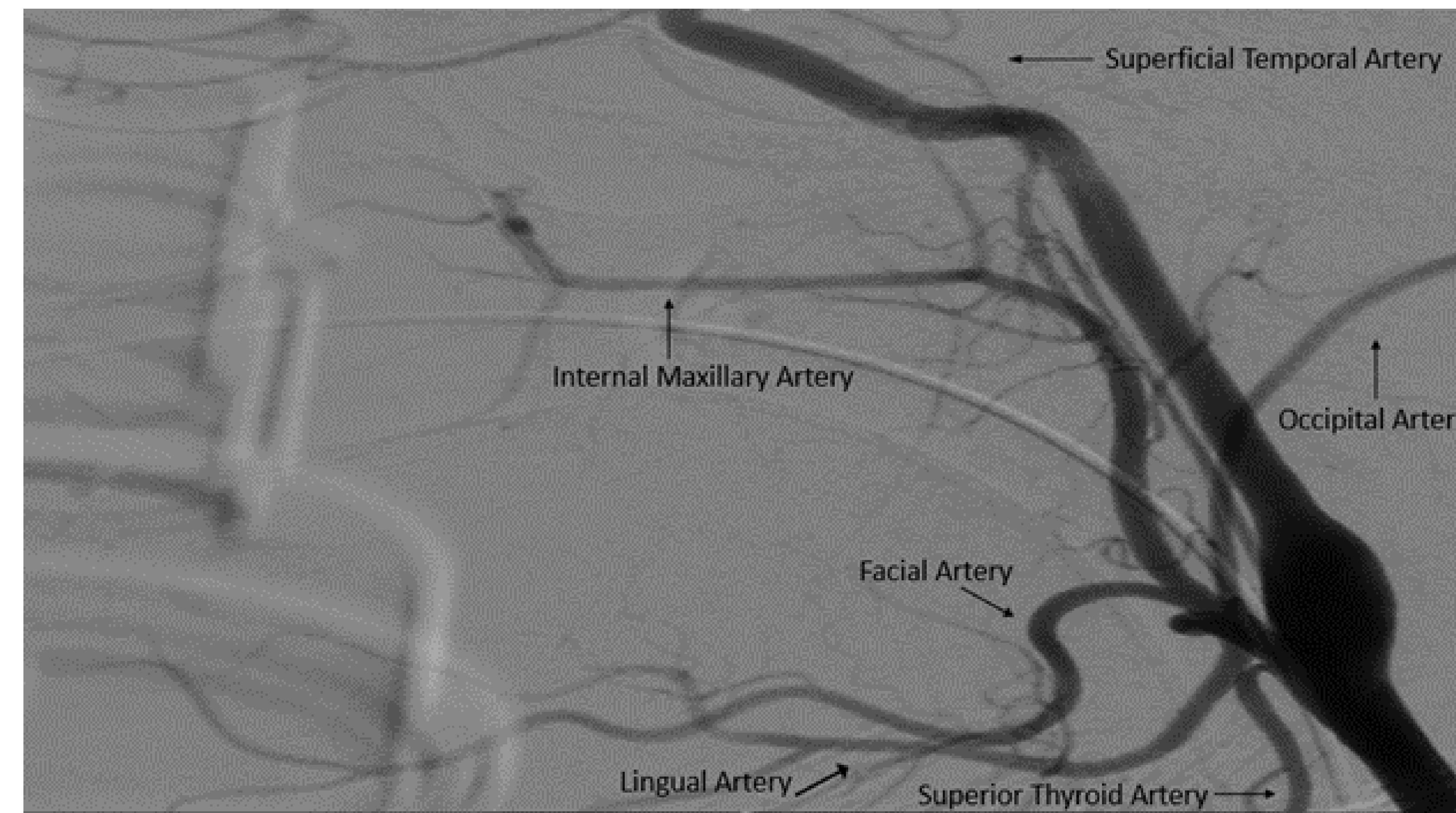
A SL 10 microcatheter was navigated into the left internal maxillary artery (IMA) from the left femoral artery and external carotid artery. Multiple platinum micro-coils were deployed through the microcatheter into the IMA artery under continuous fluoroscopic guidance; intermittent angiography was obtained during embolization for assessment of coil placement and patency of the parent and branch arteries. Next, utilizing a synchro 2 microwire, the SL 10 microcatheter was navigated into the right IMA. Multiple platinum micro-coils were deployed through the SL-10 microcatheter into the artery under continuous fluoroscopic guidance; intermittent angiography was obtained during embolization for assessment of coil placement and patency of the parent and branch arteries. Post embolization angiography demonstrated exclusion of the IMA and middle meningeal branch from the parent circulation with slow filling of the superficial temporal artery (Fig 3). The external carotid artery and branch arteries were widely patent on final angiography, otherwise unchanged in appearance in comparison to pre-embolization imaging.

Post-angiography day # 1, she was taken to the operating room and was fiberoptically intubated via nasoendotracheal intubation before she underwent bilateral temporomandibular joint replacements with Biomet stock temporomandibular joint replacements with arthroplasty of temporomandibular joints, glenoid fossae, and zygomatic arches bilaterally. Estimated blood loss intraoperatively was 200mL. Post-operatively, patient able to open jaw 25mm with improved pain

Patient 2: 37 year old female planned for bilateral temporomandibular joint replacements via coronal and preauricular/endoaural surgical approaches secondary to progressively worsening fibrous adhesions and bony ankylosis of joints. Initial maximal oral opening was 20mm. She was planned for preoperative IMA embolization. She was intubated fiberoptically via nasoendotracheal intubation prior to embolization.

was navigated into the right external carotid artery. Utilizing a synchro 2 microwire, the SL 10 microcatheter was navigated into IMA (Fig 4). Multiple platinum microcoils were deployed through the SL-10 microcatheter into IMA under continuous fluoroscopic guidance; intermittent angiography was obtained during embolization for assessment of coil placement and patency of the parent artery. Then, utilizing a 0.038 inch wire, the 6 times Envoy catheter was navigated into the left external carotid artery. Utilizing a synchro 2 microwire, the SL 10 microcatheter was navigated into the IMA. Multiple platinum microcoils were deployed through the SL-10 microcatheter into the IMA under continuous fluoroscopic guidance; intermittent angiography was obtained during embolization for assessment of coil placement and patency of the parent artery

External Carotid Artery and Branches



Post-embolization angiography demonstrated exclusion of the internal maxillary artery distal to the superficial temporal artery with retrograde filling of its distal portion. The superficial temporal artery is patent on final angiography and middle meningeal artery demonstrated slow flow. The patient remained intubated overnight.

PAD # 1, patient was taken to the operating room and placed under general anesthesia. She underwent bilateral temporomandibular joint replacements using a Biomet Zimmer alloplast with bilateral mandibular coronoidectomies and bilateral temporomandibular arthroplasty. Estimated blood loss 200cc. Uncomplicated postop course, and patient can now open mouth "2 finger breadths"

Summary and Conclusions

TMJ ankylosis is a disfiguring condition resulting in disability in mastication, digestion, speech and oral hygiene. In these patients, there is a significantly reduced maximal incisal opening requiring complete resection of ankylosing mass and joint reconstruction^{1,2,3}. The IMA is at risk of injury as it crosses the ankylosing mass. Though uncommon, hemorrhage secondary to IMA injury is difficult to control given difficulty proximal control and poor visualization, and may result in up to 3.7L blood loss^{4,5}. In the case of uncontrolled epistaxis and hypervascular tumors, IMA embolization has proven to be a safe and effective mean to stop bleeding and is now being applied to TMJ reconstructive surgery^{1,6,7}.

IMA is the terminal branch of the external carotid artery, which arises at neck of mandible. It supplies the parotid gland, pterygoid muscles, pharynx, Eustachian tube, meninges, temporal muscles, medial and lateral wall of nasal cavity, and the sphenoid, ethmoid and maxillary paranasal sinuses. It is important when embolizing the IMA to preserve the superficial temporal artery and the middle meningeal artery (MMA), as these form important anastomoses with the IMA to maintain blood flow to extracranial and intracranial structures. In cases of meningolacrimal variant, the MMA supplies the entire orbit, making patency of the vessel crucial⁸.

Given the limited maximal incisal opening in TMJ ankylosis, pre-embolization fiber optic intubation is required in anticipation of potential for complication requiring emergency intervention. Unilateral IMA embolization does not prevent hemorrhage during TMJ reconstruction, leading most interventionalists to selectively embolize bilateral IMAs^{5,7}. In our cases, after embolization, both patients had successful TMJ reconstruction with 200cc blood loss. In comparison to another case study involving TMJ reconstruction with pre-operative IMA embolization resulting in less than 300cc blood loss, pre-operative embolization has proven to be a safe and effective procedure for prevention of hemorrhagic complications in TMJ reconstruction¹.

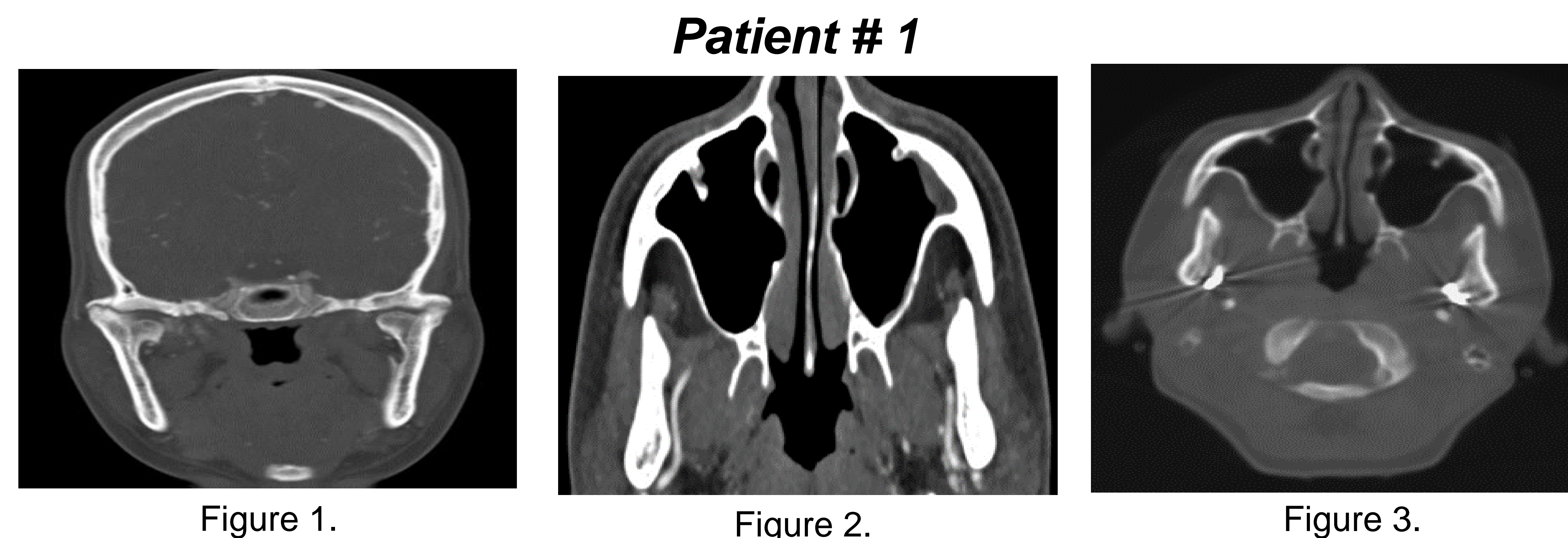


Figure 1. CTA demonstrating bilateral temporomandibular joint ankylosis after trauma. **Figure 2.** Pre-embolization CTA demonstrating patent bilateral Internal Maxillary Arteries. **Figure 3.** Post-embolization CTA demonstrating bilateral Internal Maxillary Artery coil masses.

Patient # 2

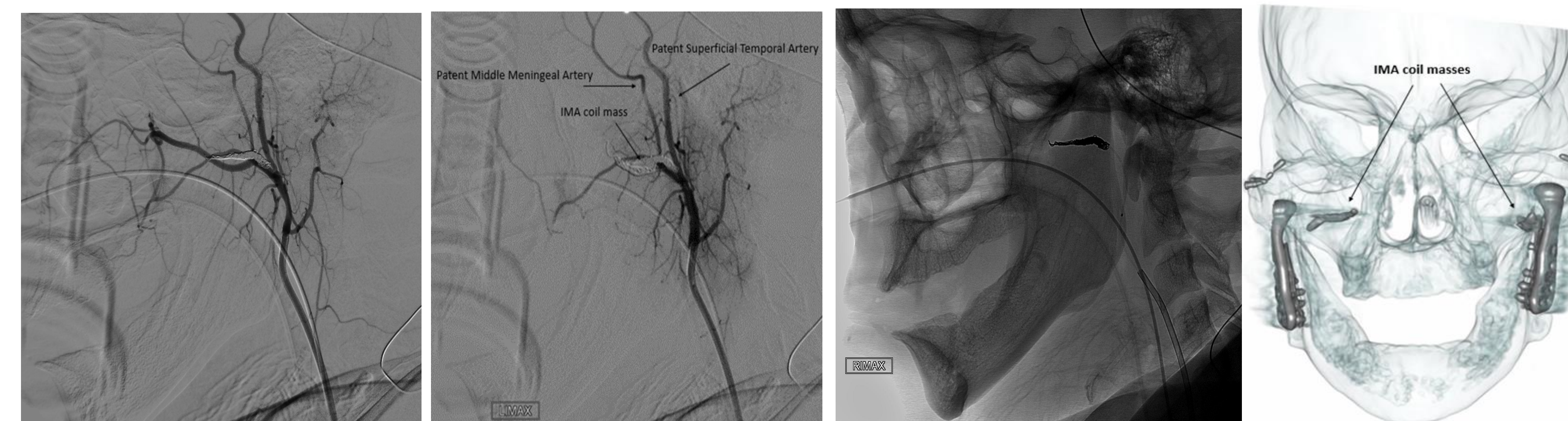


Figure 4. Pre-embolization of IMA. **Figure 5.** Post-embolization of IMA with patent Middle Meningeal Artery and Superficial Temporal Artery. **Figure 6.** Lateral xray demonstrating IMA coil mass location post-embolization. **Figure 7.** Post-surgical CT demonstrating bilateral IMA coil masses in relation to reconstructive TMJs.

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