



## Superselective Angioembolisation: A Report of Two Rare Cases of Hemoptysis

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**Abstract**

Superselective bronchial embolization is recently performed with a high success rate. The current study aimed at discussing the procedure and reporting two cases underwent embolization in the Masih-Daneshvari Hospital, a large center for this procedure, in Iran.

### INTRODUCTION

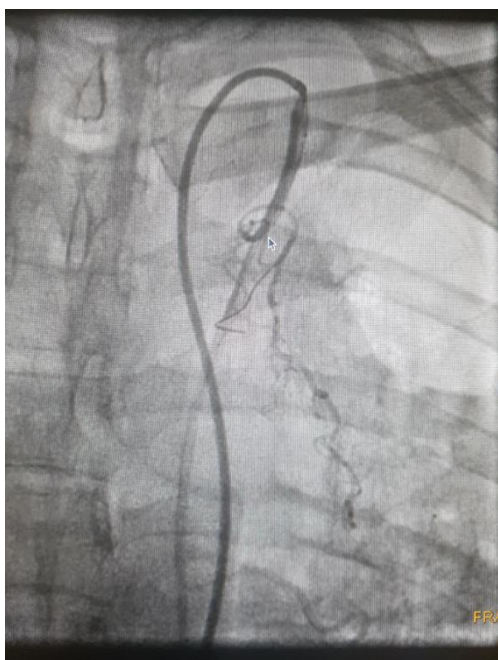
Bronchial arteries embolization (BAE) is mainly performed in moderate to severe hemoptysis cases irresponsive to medical managements [1]. This procedure remains a palliative procedure for management of hemoptysis in patients who are not candidate for more invasive treatments such as surgery. Most common reported underlying diseases are tuberculosis (TB), bronchiectasis, and aspergillomas [1]. Short-term success and immediate bleeding cessation were high; however, recurrence may occur. Recurrence may be due to incomplete embolization, recanalization of previously embolized vessels, and recruitment of new collaterals due to main disease progression. Presence of non-bronchial systemic collaterals, abnormal site of collaterals (e.g. coronary arteries), bronchopulmonary shunting, aspergillomas reactivation, and multidrug resistant TB are associated with higher recurrence rates. After 2010, most published reports emphasized superselective embolization to decrease procedural complications and administration of polyvinyl alcohol (PVA) in lower doses [1].

The initial control rate of hemoptysis was reported 96% (21 of 22) in a study on a superselective group and 88% (22 of 25) in the non-superselective group. Cumulative

hemoptysis control rates of the super-selective and non-superselective groups were 80% and 67% at six months, 79% and 56% at one and two years, and 79% and 48% at three years, respectively; although the difference was insignificant using the generalized Wilcoxon test. One major complication (spinal infarction) occurred in the non-superselective group [2]. Superselective embolization enabled bypassing spinal arteries and abolished smaller and more distal and torturous arteries, which led to better control of hemoptysis and lower risk of complications.

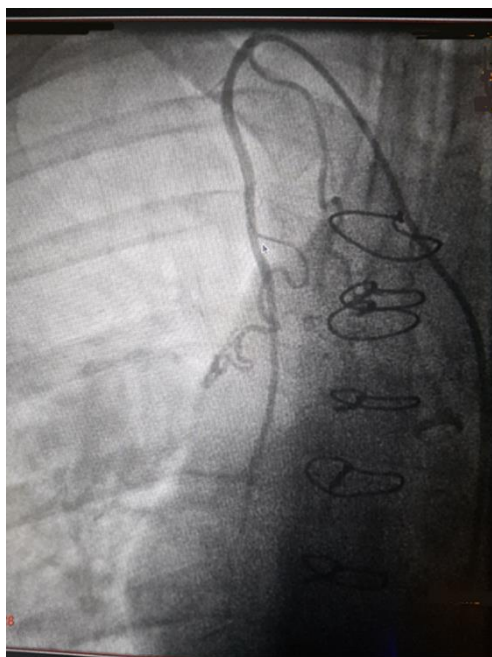
### CASE PRESENTATION

Here is the report of two successful cases of rare superselective BAE. The first case was a 34-year-old male with the history of bronchiectasis presented with massive hemoptysis. Based on chest computed tomography (CT) scan images, bleeding source was in the right side. The patient was scheduled for the embolization of bronchial arteries originated from thoracic region. The procedure was performed with PVA successfully with no complications. Seven days later, the patient returned and this time CT scan images showed the left sided bleeding.



**Figure 1.** Superselective embolization in a branch artery originating from left internal mammary artery

Then the patient underwent angiography and the target vessels were detected as some branches originating from left internal mammary artery (Fig 1). Selective embolization was performed on the determined vessels. For this propose, a 6F guide catheter was inserted. A 0.014-inch hydrophilic guidewire (pilot 50 Abbott Vascular, Ltd.) was passed through the tortuous vessel with a 2.7-Fr. microcatheter (Rebar 18, Ev3 Co.).



**Figure 2.** Superselective embolization in a branch artery originating from right internal mammary artery

Two milliliters of PVA 700 was injected via the microcatheter into the target vessels. The patient was

admitted to the intensive care unit and discharged after two days with no hemoptysis. Three months follow-up showed no sign of bleeding recurrence.

In the second case, a 32-year-old male patient with chronic thromboembolic pulmonary hypertension, aberrant bronchial vessel originated from right internal mammary artery (Fig 2). After embolizing the thoracic branches, superselective embolization was performed on the aberrant vessel using the aforementioned technique. Both procedures were performed with the injection of 3000 units of intravenous heparin, BiPAP oxygen mask to perform O<sub>2</sub> saturation > 90%, and 6-Fr right transfemoral artery sheath size.

## CONCLUSIONS

In patients with hemoptysis, BAE can be a curative procedure after medical treatment or may be a bridge therapy before surgery for stabilizing the patient's conditions and postponing the surgery until the stabilization of patient's conditions. Although surgery is a definitive therapy, it carries a mortality of 18% when performed electively, which can increase to 40% when performed emergently [3]. Bronchial embolization is a minimally invasive procedure, which can be performed in critically ill patients.

Angiographically, the bronchial arteries arise from the descending thoracic aorta between the upper t5 and the lower t6 vertebral bodies in 70% of the normal population. Another 10% remain a first order branch of the thoracic aorta or arch, but outside of the t5-t6. The remaining 20% originate from a variety of structures including the thoracic (brachiocephalic, subclavian, internal mammary, pericardiophrenic, or thyrocervical) and abdominal (aorta, inferior phrenic or celiac) branches [4-6].

Non-bronchia collaterals should be assessed and treated concurrently with the bronchial arteries at the time of initial arteriogram. In the two reported cases, two non-bronchial collaterals were successfully embolized following the embolization of bronchial arteries. Likewise, the application of microcatheter in a coaxial technique is now well documented for selective catheterization and administration of embolic agents [7, 8]. Technical success rate is reported 90% [9].

Amongst articles published before 2010, superselective embolization was notably reported in four studies [10]. In the current study center, the success rate of bronchial embolization was about 92% and complication rate 10%. Right bronchial arteries are the most common bronchials embolized in previous reports, while non-bronchial systemic collaterals were embolized in the first session in about 40%-62% of patients in different reports [11].

The intercostal and internal mammary arteries were the most frequently embolized non-bronchial systemic collaterals [11].

Ramakantan et al., recommended not to embolize non-bronchial systemic collaterals in the first session [12].

Although it is a safe procedure, the search for non-bronchial arteries reduces the recurrence rate [13]. In the current study center, the non-bronchial arteries were routinely examined in the same session, which helped us with the better control of hemoptysis. For the non-bronchial arteries, superselective embolization is preferred due to lower complications and better outcomes. In other bronchials, superselective embolization did not perform routinely and our findings were similar to those of other studies. The non-superselective embolization is easy to perform and cost-effective. However, the shorter duration and less contrast injection are the other advantages of the procedure.

Neurologic complications due to spinal cord ischemia leading to transient or permanent paraparesis or paraplegia occur in 0.6%–4.4% of the cases [14–16]. It is mostly attributed to inadvertent embolization of spinal arteries arising from bronchial or intercostobronchial arteries. However, in two studies with the incidence of paraparesis, spinal arteries were not visualized even on retrospective review of the digital subtraction angiography images. Although some authors considered visualization of anterior spinal artery as a contraindication for BAE [14–16], superselective catheterization enabled safer embolization in most studies.

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