On-line Supplement

Randomized trial of first-line bronchial artery embolization for non-severe hemoptysis of mild abundance

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Content

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Interventions

Patients allocated to the interventional strategy received medical therapy as per current routine practice in each center, in combination with BAE performed within 12 hours after randomization, and at least 6 hours after any intravenous infusion of terlipressin, if administered. Those allocated to the medical strategy received medical therapy alone.

General medical measures - Medical therapy administered to all patients, regardless of the randomization arm, included bed rest and fasting, continuous monitoring of oxygen saturation, respiratory rate, heart rate and arterial blood pressure, as described elsewhere (1). Oxygen was delivered to obtain a pulse oxymetry >90%. No attempt was made to suppress cough. Additional measures aiming at controlling persistent bleeding were left at the discretion of the attending physicians. When deemed necessary, bronchoscopic techniques used cold saline solution lavage or topical vasoconstrictive agents, and systemic terlipressin was administered at a dose of 1 mg intravenously every 4 to 6 hours. As the indications of these additional procedures were likely homogeneous in each participating center, the randomization by center was expected to limit potential bias related to their use.

BAE procedure - The BAE procedure was performed by experienced radiologists and standardized in all centers (2,3). A catheter was introduced into the right femoral artery using the Seldinger technique. Selective catheterization of systemic (bronchial and non-bronchial) arteries was performed, using 4 to 5 French catheters, according to etiology and bleeding site identified on MDCTA (alveolar or ground glass opacities, intra-bronchial materials), vascular mapping and abnormal findings on angiography (enlarged or tortuous arteries), or when arteries had a near-normal aspect but supplied the bleeding site. The use of microcatheter (2.4 or 2.7F) was encouraged for embolization, which mainly used acrylic beads of 500 to 1100 µm and polyvinyl alcohol particles of 400 to 1000 µm (2,3).

Potential adverse events recorded

Potential complications expected to be related to the interventions were categorized into minor and major complications.

Complications related to the interventional radiological strategy could be associated with arterial catheterization, administration of contrast medium or the embolisation procedure *per se*. Minor complications were local groin puncture hematoma, vasospasm, arterial dissection or perforation, hyperthermia, dysphagia, or chest pain. Major complications included neurological events (spinal cord ischemia leading to transient or permanent paraparesis or paraplegia; transient cerebral ischemia/stroke); vascular non-neurological events (myocardial infarction, systemic ischemia other than cerebral, pulmonary infarction); hemorrhagic events (overt bleeding with one of the followings: fall in hemoglobin of ≥ 2 g/100 mL compared to the initial value, need for red blood cells transfusion; need for surgical cure of hematoma); metabolic events (acute renal failure); and others (contrast media hypersensitivity, diaphragmatic paralysis; femoral artery aneurysm at puncture site).

Minor complications related to the medical management included acrocyanosis, abdominal cramps, diarrhea, headache, and symptomatic hyponatremia; major complications included systemic hypertension, myocardial ischemia, ventricular and supraventricular arrhythmia, and limb hypoperfusion.

1 Fartoukh M, Khalil A, Louis L, Carette MF, Bazelly B, Cadranel J, Mayaud C, Parrot A. An integrated approach to diagnosis and management of severe hemoptysis in patients admitted to the intensive care unit: a case series from a referral centre. Respir Res 2007; 8: 11.

2 Khalil A, Fedida B, Parrot A, Haddad S, Fartoukh M, Carette MF. Severe hemoptysis: From diagnosis to embolization. Diagnostic and Interventional Imaging 2015; 96: 775-788.

3 Panda A, Bhalla AS, Goyal A. Bronchial artery embolization in hemoptysis: a systematic review. Diagn Interv Radiol 2017; 23: 307-317.

eTable 1

Failure of the initial strategy, including bleeding recurrence at 30 and 90 days, and duration of follow-up in patients with mild-to-moderate hemoptysis allocated to a medical management strategy alone (M) or to the interventional strategy (I) with bronchial artery embolisation (BAE) in addition to medical management.

	Patient No.	Treatment arm*	Initial bleeding amount, mL	Bleeding recurrence			Follow-up
				Date, d	Amount, ml	Treatment	Days, no
Failure of the initial strategy (n=1)	1	I†	120	-	-	-	103
30-day bleeding recurrence, (n=18)	2	M	150	D0	50	Intravenous terlipressin	130
	3	M	150	D0	50	BAE	138
	4	M	110	D0	70	BAE	90
	5	M	100	D0	80	Supplemental oxygen	99
	6	M	120	D0	90	Supplemental oxygen	90
	7	M	200	D0	180	Supplemental oxygen	97
	8	M	120	D0	180	BAE	164
	9	M	120	D1	80	BAE	90
	10	M	120	D1	300	BAE	95
	11	M	120	D2	55	BAE + supplemental oxygen	98
	12	M	120	D2	80	Supplemental oxygen	91
	13	M	140	D2	210	BAE	90
	14	M	120	D3	290	Intravenous terlipressin + BAE	122
	15	M	150	D3	1000	Mechanical ventilation	90
	16	M	200	D5	100	BAE	92
	17	I	200	D0	100	Supplemental oxygen	48
	18	I	150	D4	50	BAE	104
	19	I	120	D8	100	BAE	40
Bleeding recurrence status unknown at day 30, (n=2)‡	20	M	110	-	-	-	29
	21	M	160	-	-	-	2
Bleeding recurrence status unknown at day 90, (n=2)‡	22	M	200	-	-	-	74
	23	I	100	-	-	-	67

Abbreviations: d day; BAE: bronchial artery embolization

D0 is the day on which the strategy was applied
* Treatment arm: I, interventional (BAE); M: medical
† technical failure of BAE
‡ None of these patients had recurrent bleeding documented at time of loss to follow-up.

The rate of hospital readmission or invasive treatment for bleeding recurrence in patients followed-up to day 90 was 25.7% (9/35) in the medical strategy group and 6.3% (2/32) in the interventional strategy group (difference 19.5%, 95% CI 2.7 to 36.2, *P*=.032).

e-Table 2. In-hospital complications related to the intervention

Complication	Date of diagnosis	Intensity	Management and follow-up
local groin puncture hematoma	D0	minor	none spontaneous resolution (D18)
bronchial artery dissection	D0	minor	none
acute renal dysfunction	D2	minor	none spontaneous resolution (D6)
spinal cord ischemia; splenic, renal and pancreatic infarction	D1	major	- paresis, resolving with rehabilitation care - splenic, renal and pancreatic infarction, resolution at 6–month follow-up

D0 = day on which the strategy was applied.