

SUB-SEGMENTAL PULMONARY ENDARTERECTOMY: TIME FOR A NEW SURGICAL CLASSIFICATION

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Background: Recent refinements in the technique of pulmonary endarterectomy (PEA) allow more meticulous distal segmental and subsegmental resection of organized thrombus. The relevance of sub-segmental occlusion in the spectrum of chronic thromboembolic pulmonary hypertension (CTEPH) has not been adequately characterized, with the concern that this may be the result of in-situ thrombosis secondary to small vessel disease and not post-embolic in nature.

Methods: Since January 2013, a new surgical classification has been internally used at the University of California San Diego (UCSD) to identify patients having undergone a subsegmental endarterectomy. A review of 201 cases at UCSD from January 2013 to March 2014 was completed. The surgical specimens removed were classified using traditional surgical classification (Jamieson Types I-IV), as well as the new UCSD surgical level classification (UCSD Level I-IV). All specimens were assessed by an experienced surgeon according to this new surgical classification:

Level 0 – No evidence of CTE (chronic thromboembolic disease)

Level I – CTE at the level of main pulmonary arteries

- Level 1C: Complete occlusion and non-perfusion of one lung

Level II – CTE at the level of lobar or intermediate arteries

Level III – CTE at the segmental level

Level IV – CTE at the subsegmental level

Results: 58 patients (28.8%) had a change in their CTE classification on at least one side. Of those, 45% were related to the presence of “fresh” thrombus (stasis clot), this being “Type 1” disease regardless of the level of resection according to the old classification. 12 (58.3% female) out of 46 patients (26.1%) previously categorized as bilateral Type 3 disease were subsegmental resections and re-classified as Level IV disease. Pre-operative hemodynamic assessment performed in this group revealed: mPAP of 42.5 ± 10.2 mmHg, CO 4.02 ± 0.88 l/m, and PVR of 722 ± 335 dyn·s/cm⁵ (33% with PVR > 1000). Post-op hemodynamics at the end of ICU stay revealed: mPAP of 29.4 ± 9.8 mmHg, CO 4.74 ± 1.39 l/m, and PVR of 409 ± 215 dyn·s/cm⁵ (33% with PVR > 500). Preoperatively, 67% of patients were receiving some form of pulmonary hypertension specific medical therapy. The hemodynamic benefit achieved with endarterectomy allowed discontinuation of medical therapy in half of these patients. There was no in-hospital mortality in this group.

Conclusions: This small series demonstrates that PEA of subsegmental CTE disease by an expert surgeon can result in significant improvement in pulmonary hemodynamics. The previously utilized surgical classification did not adequately describe the level of thrombus resection in this challenging group of patients (Fig. 1) and it is conceivable that some may have been previously labeled as having “no disease” (Type 4). UCSD’s new surgical classification provides greater clarity as to the anatomical location of CTE disease.

Figure 1 – Right and left pulmonary angiograms and the corresponding specimen removed from a 66 yo female suffering from severe pulmonary hypertension. The patient had Level IV disease, signifying a subsegmental resection.

