An 80-year-old male with prior mitral valve repair presented with recurrent severe mitral regurgitation. He had previously undergone posterior mitral leaflet repair consisting of leaflet resection and posterior annuloplasty band in 1998 for Barlow’s disease with severe mitral regurgitation. The patient presented with NYHA class III–IV symptoms. Transthoracic echocardiogram reported an ejection fraction of 53% and anterior mitral leaflet prolapse with posteriorly directed severe mitral regurgitation. Intra-operative 2-D transoesophageal (TEE) evaluation revealed intact previous repair and new pathology consisting of a prolapsing middle (A2) and medial (A3) scallops of the anterior leaflet (white arrow-top row) generating a posterior-lateral jet of mitral regurgitation with large convergence zone (black arrow-top row). Real-time 3-D transoesophageal images from the left atrial perspective revealed a large, unsupported medial scallop (Panel A, asterisk, arrows represent medial annuloplasty band aspect) without flail and no further prolapsing segments, corresponding precisely with surgical findings (Panel B, asterisk, arrows denote medial annuloplasty band aspect). A pair of Gore-tex neochordae were inserted to the medial scallop of the anterior leaflet (Panel C, arrow indicates neochordae suture-ends) and posterior-medial papillary muscle. Following cardiopulmonary bypass, appropriate coaptation of medial scallops was confirmed by 3-D (Panel D, arrow indicates neochordae suture-ends) with no residual mitral regurgitation. The patient did well postoperatively. In patients with myxomatous mitral disease, the ability to identify the size and location of the prolapsing segments and their associated regurgitant jets are particularly useful for planning surgical intervention, especially in case of re-repair where native anatomy can be obscured by prior repair, and a specific goal-directed surgical strategy is required.