Extensive bone loss, as encountered in both revision arthroplasty of the hip and after resection of malignant tumors of the pelvis, is a major challenge for the surgeon as well as for the revision implant. The aims are, despite extensive acetabular defects, to achieve a primary and load-stable fixation of the revision prosthesis in the pelvic bone as well as restoring the physiological joint biomechanics. At present, a large number of different alloarthroplastic revision implants and complex techniques are available for reconstruction of acetabular deficiencies. According to D'Antonio's classification of acetabular defects, particularly high-grade defects with loss of the posterior column or a pelvic discontinuity require special attention regarding implant selection and surgical planning. The object of this paper is to highlight the most important tools and techniques of endoprosthetic reconstruction for grade III and IV defects (D'Antonio) of the acetabulum by means of a classification-oriented therapeutic concept and to discuss the pros and cons of the particular implant.