Pelvic reconstruction after extralevator abdominoperineal resection for rectal cancer: is there a place for a biological mesh in perineal wound complication?

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The extralevator abdominoperineal resection (eAPR) is an operation with wider excisions, *en bloc* resection of the distal rectum, sphincter complex, and levator muscles resulting in a cylindrical specimen. This eAPR has improved oncologic outcome by reducing the rate of positive resection margins and tumor perforation, whereas the risk of perineal wound complication and hernia especially combination with preoperative chemoradiotherapy (CRT) became a major concern to surgeons (1,2). So far, many techniques have been tried to solve perineal complications, but its results are not satisfactory and there have been pros and cons according to each method. Primary closure is a simple and economical method with high perineal wound complication and perineal herniation. Myocutaneous flaps using gluteus maximus and rectus abdominus muscle show less complication and herniation rate than primary closure but are expensive and not suitable for wide perineal defect (3,4). Recently, the biological mesh implantation has emerged as an alternative method for pelvic floor repair and reconstruction after eAPR (1,5). Although a biological mesh reconstruction is more expensive than a flap reconstruction, overall costs can be reduced because of the shorter operation time and shorter hospital stay compared to myocutaneous flaps (6,7). The biological mesh also has the advantage of being absorbable and can implant on infected environments (8). But the relatively poor quality of available research in the literature remains a problem.

In this issue of Annals of Surgery, Musters *et al.* (9) report the results of a multicenter randomized trial comparing between primary closure of the perineal defect and pelvic floor reconstruction using a biological mesh followed by primary perineal closure after eAPR for rectal cancer: the BIOPEX-study. In this study, 104 patients who received preoperative CRT were randomly assigned to primary closure (n=54) and biological mesh closure (n=50). Regular blinded wound follow-up, using the Southampton wound healing score, perineal wound complication rate at 30 days was 34% after primary closure, which did not significantly differ from 37% after biological mesh closure [relative risk 1.056; 95% confidence interval (CI): 0.7854–1.4197; P=0.7177]. At 12 months follow-up, the healing rates did not differ between groups (52% *vs.* 54%, P=0.5916).

There is the considerable difference in perineal wound complication rates between the systematic review of the literature and the BIOPEX-study. The relatively high statistical heterogeneity seen among previous studies could be the result of non-standard assessment of perineal wounds and definitions used for classification of perineal wound complication. In the BIOPEX-study, evaluating perineal wound by blinded assessors using a generalized Southampton wound score system, which that was relatively optimized for perineal wound complications. Authors attempted to minimize inter and intraobserver variability. Either omentoplasty or use of perineal drains in the biological mesh group did not show a significant result in the *post-hoc* analysis on perineal wound healing in the BIOPEX-study. The BIOPEX-study showed freedom of perineal hernia at 1 year was 73% (95% CI: 60.93–85.07)

versus 87% (95% CI: 77.49–96.51), respectively (P=0.0316). The hernias occurred nearer the end of the 12 months follow-up in the mesh group. This delayed presentation of perineal herniation is due to the slower degradation of the biological mesh which fully degraded up to 1 year (10) and the perineal hernia rate is expected to increase over time in long term follow up. Biological mesh seems to protect, at least in early follow-up, from the occurrence of perineal hernia in comparison to primary closure, we need to wait for long term follow up results for final conclusion.

This is an important study, and the authors would like to congratulate for the quality and outcomes of the surgery performed, the fastidious trial design, and the impressive recruitment rates from multiple accredited centers. Although this study could not demonstrate the superiority of pelvic reconstruction using a biological mesh in perineal wound healing compared to primary closure after eAPR in patients with rectal cancer with preoperative CRT, it is only multicenter randomized controlled trial focusing on perineal reconstruction using biological mesh after eAPR in terms of short and long term perineal wound complications and perineal herniation. Previous studies of various reconstruction methods are retrospective or simple cohort studies analyzing oncologic outcome without concentrating on perineal wound complications and herniation with relatively poor quality. In addition, the severity of perineal wound complications and the grading system are different for each study, making it difficult to draw meaningful conclusions. Yet, the role of biological mesh reconstruction in reducing perineal wound complications is less clear, newer techniques and further studies need to be investigated to resolve the increasing clinical problem of perineal wound complications. Biological mesh closure showed promising result on preventing early perineal hernia, but occurrence of delayed perineal herniation after biological mesh degradation needs longer follow-up.

Perineal reconstruction following eAPR still remains a major problem and challenge. What is the best surgical method of pelvic reconstruction after eAPR in patients with rectal cancer with preoperative CRT? Then what does it mean to be the best reconstruction method. Is it the one with the lowest perineal wound complication and herniation rate? Is it the method with the easiest to perform, or the best of patient's quality of life? To give the answer to these questions new technique and further high-quality studies with various methods are needed. To date, only one single-center, open-label randomized controlled trial is being conducted in which patients are randomized between a biological mesh and gluteus maximus myocutaneous flap closure of the perineal wound after eAPR (NEAPE; clinicaltrial.gov identifier: NCT01347697). In a systematic review of cohort studies, there was no significant difference in complication rates between biological mesh and flap repair (11). The results of the NEAPE trial is even more awaited because comparison of published data is unreliable due to small number of patients included in published studies and their heterogeneity.

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