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PRESERVATION OF MALE SEXUAL FUNCTION FOLLOWING ABDOMINOPERINEAL RESECTION FOR LOWER RECTAL ADENOCARCINOMA: CLINICAL CONSIDERATIONS AND SURGICAL STRATEGIES

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ABSTRACT

Abdominoperineal resection (APR) remains a standard surgical approach for patients with low rectal adenocarcinoma when sphincter preservation is not oncologically feasible. Despite its effectiveness in achieving local disease control, APR is associated with a high incidence of postoperative male sexual dysfunction, primarily erectile dysfunction and ejaculatory disorders. These complications arise mainly from injury to the pelvic autonomic nervous system during deep pelvic dissection. This article reviews the anatomical and pathophysiological mechanisms underlying sexual dysfunction after APR, evaluates nerve-sparing surgical strategies, and summarizes clinical evidence on functional outcomes. A narrative analysis of published clinical studies indicates that preservation of the hypogastric nerves and pelvic plexus significantly improves postoperative sexual function without compromising oncologic radicality in selected patients. Comprehensive preoperative assessment and structured postoperative rehabilitation are essential components of patient-centered care. Integrating nerve-sparing principles into APR, when oncologically safe, can mitigate sexual morbidity and improve long-term quality of life.

Introduction

Abdominoperineal resection is a well-established oncologic procedure for the treatment of low rectal adenocarcinoma, particularly in cases where tumors involve the anal sphincter complex or are located very close to the dentate line. The operation entails en bloc resection of the distal rectum, anal canal, and surrounding mesorectal tissues, resulting in a permanent end colostomy. While APR ensures adequate oncologic margins, it is associated with considerable functional morbidity, notably impairment of male sexual function.

Sexual dysfunction following rectal cancer surgery has been documented for several decades and remains a major determinant of postoperative quality of life. Erectile dysfunction, ejaculatory failure, and orgasmic disturbances occur frequently after APR due to unavoidable proximity of surgical dissection to the pelvic autonomic nerves. Reported rates of postoperative sexual dysfunction in men after APR range from 60% to over 80%, depending on patient age, tumor stage, surgical technique, and preoperative sexual status.

With increasing emphasis on survivorship and quality-of-life outcomes in colorectal cancer care, preservation of sexual function has become an important objective alongside oncologic radicality. Advances in pelvic anatomy, surgical visualization, and nerve-sparing techniques have provided opportunities to reduce neurogenic injury during APR in selected patients.

Methodology

This article is based on a narrative review of peer-reviewed clinical studies, anatomical analyses, and outcome reports addressing male sexual function after abdominoperineal resection for rectal adenocarcinoma. Sources were selected from major surgical and oncologic journals focusing on autonomic nerve anatomy, sexual outcomes after rectal cancer surgery, and nerve-preserving surgical strategies. Emphasis was placed on studies that evaluated erectile and ejaculatory function using validated assessment tools and that clearly described the extent of nerve preservation. Only data derived from published clinical evidence were used.

Results

Clinical evidence consistently demonstrates a strong association between injury to pelvic autonomic nerves during APR and postoperative sexual dysfunction. Studies comparing nerve-sparing and non-nerve-sparing techniques show significantly better sexual outcomes when autonomic structures are preserved [5].

Patients in whom both hypogastric nerves and the inferior hypogastric plexus were fully preserved exhibited substantially higher rates of maintained erectile function. In selected cohorts undergoing complete autonomic nerve preservation, postoperative erectile function was retained in approximately 85–92% of patients, while ejaculatory function was preserved in 75–82% [6]. In contrast, patients undergoing partial nerve preservation or non-preserving APR demonstrated markedly higher rates of erectile dysfunction, often exceeding 70% [7].

Despite these improvements, even meticulously performed nerve-sparing APR does not completely eliminate the risk of sexual dysfunction. This reflects the complex and

variable anatomy of the pelvic plexus, as well as the oncologic necessity for radical dissection in advanced disease [8].

Analysis and Discussion

Abdominoperineal resection remains an essential surgical option for patients with low rectal adenocarcinoma when sphincter-preserving procedures are oncologically unsafe. Despite improvements in perioperative care and surgical precision, male sexual dysfunction continues to be one of the most frequent and distressing long-term complications following APR. The high prevalence of postoperative erectile and ejaculatory disorders reflects the close anatomical relationship between the rectum and the pelvic autonomic nervous system, as well as the radical nature of the dissection required to achieve adequate oncologic margins.

Clinical evidence accumulated over several decades clearly demonstrates that damage to the superior hypogastric plexus, inferior hypogastric plexus, and cavernosal nerves is the principal mechanism underlying sexual dysfunction after APR [1]. These neural structures are responsible for sympathetic control of ejaculation and parasympathetic regulation of penile erection. During deep pelvic dissection, even minimal deviation from anatomical planes can result in traction, compression, or thermal injury to these nerves, leading to transient or permanent neurogenic dysfunction [2].

Historical series of APR performed before the widespread adoption of nerve-preserving principles reported rates of postoperative erectile dysfunction exceeding 70%, with complete loss of erectile capacity observed in a substantial proportion of patients [3]. These early outcomes established sexual dysfunction as an almost inevitable consequence of APR. However, advances in pelvic anatomy knowledge and surgical technique have challenged this assumption, demonstrating that functional preservation is possible in carefully selected cases.

Comparative studies evaluating nerve-sparing versus conventional APR consistently show superior sexual outcomes when autonomic nerves are preserved. Patients undergoing complete preservation of both hypogastric nerves and the pelvic plexus demonstrate significantly higher rates of maintained erectile and ejaculatory function compared with those undergoing partial or non–nerve-sparing resections [4]. Importantly, these functional benefits do not appear to compromise oncologic outcomes when nerve preservation is performed within appropriate tumor-related constraints.

Nevertheless, the feasibility of autonomic nerve preservation during APR is highly dependent on tumor characteristics. Locally advanced tumors with direct invasion of the mesorectal fascia, prostate, or lateral pelvic wall often necessitate wider excision, rendering nerve-sparing techniques unsafe from an oncologic perspective [5]. In such cases, radical resection takes precedence over functional preservation, underscoring the need for individualized surgical planning.

Patient-related factors also significantly influence postoperative sexual outcomes. Advanced age, preexisting erectile dysfunction, diabetes mellitus, vascular disease, and prior pelvic radiotherapy are all associated with reduced likelihood of functional recovery following APR [6]. These factors may exacerbate nerve injury or impair neurovascular regeneration, even when anatomical preservation is achieved. Consequently,

preoperative assessment of baseline sexual function is essential for realistic patient counseling and postoperative evaluation.

The complexity of pelvic neuroanatomy further complicates attempts at functional preservation. The pelvic plexus exhibits considerable interindividual variability in size, branching pattern, and proximity to the rectal wall. Even with meticulous dissection along embryological planes, microscopic nerve fibers may be inadvertently damaged [7]. This variability explains why some patients experience sexual dysfunction despite apparent nerve preservation during surgery.

In addition to direct nerve injury, indirect mechanisms contribute to postoperative sexual dysfunction. Pelvic fibrosis, vascular compromise, and inflammatory changes following surgery or adjuvant radiotherapy can impair neural signaling and penile blood flow [8]. Radiotherapy, in particular, has been independently associated with higher rates of erectile dysfunction, even in patients undergoing nerve-sparing surgery. This highlights the multifactorial nature of sexual dysfunction after rectal cancer treatment.

From a functional perspective, erectile dysfunction is more commonly reported than ejaculatory dysfunction after APR. This may reflect the greater vulnerability of parasympathetic fibers responsible for erection compared with sympathetic pathways controlling ejaculation [9]. However, loss of ejaculation, retrograde ejaculation, and orgasmic disturbances significantly affect patient satisfaction and quality of life, emphasizing the need for comprehensive functional assessment beyond erectile capacity alone.

The growing emphasis on quality-of-life outcomes in colorectal cancer survivorship has led to increased recognition of sexual health as a legitimate clinical endpoint. Validated tools such as the International Index of Erectile Function provide standardized measures for assessing sexual outcomes and facilitate comparison across studies [10]. However, heterogeneity in assessment methods and follow-up duration remains a limitation in the current literature.

Postoperative rehabilitation plays a crucial role in optimizing sexual recovery following APR. Evidence from urologic and colorectal studies suggests that early initiation of penile rehabilitation strategies can enhance erectile function, particularly in patients with preserved or partially intact autonomic nerves [11]. Phosphodiesterase-5 inhibitors improve cavernosal blood flow and may promote neural recovery, while vacuum erection devices and intracavernosal injections provide mechanical or pharmacologic assistance when oral therapy is insufficient.

Psychological factors must also be considered in the interpretation of sexual outcomes after APR. Body image changes related to permanent colostomy, anxiety regarding cancer recurrence, and depression can all negatively affect sexual desire and performance [12]. Multidisciplinary care involving psychological support and sexual counseling has been shown to improve patient-reported outcomes and partner satisfaction.

Despite accumulating evidence supporting nerve-sparing approaches, there remains a lack of standardized protocols for autonomic nerve preservation in APR. Variations in surgical training, institutional experience, and tumor presentation

contribute to inconsistent application of nerve-preserving techniques. Prospective studies with long-term follow-up are needed to establish clear guidelines and identify patients most likely to benefit from functional preservation strategies.

Another important consideration is the balance between oncologic radicality and functional preservation. While nerve-sparing techniques are desirable, they should never compromise complete tumor excision or local disease control. Long-term survival remains the primary objective of rectal cancer surgery, and functional outcomes must be optimized within this oncologic framework.

In this context, shared decision-making is essential. Patients should be informed preoperatively about the potential risks and benefits of nerve preservation, including the possibility that oncologic findings during surgery may necessitate more radical resection than initially planned. Transparent communication enhances patient satisfaction and aligns surgical goals with individual expectations.

Future research directions include refinement of minimally invasive approaches, such as laparoscopic and robotic APR, which offer enhanced visualization of pelvic anatomy. Early data suggest that improved magnification and precision may facilitate more consistent nerve identification and preservation, although robust long-term functional data are still limited.

Conclusion

Male sexual dysfunction following abdominoperineal resection for low rectal adenocarcinoma is common and primarily neurogenic in origin. Preservation of pelvic autonomic nerves during APR, when oncologically safe, significantly improves erectile and ejaculatory outcomes. Comprehensive preoperative assessment, patient counseling, meticulous surgical technique, and structured postoperative rehabilitation are critical components of care. Balancing oncologic radicality with functional preservation should remain a central objective in modern rectal cancer surgery.

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