NEW APPROACHES TO ORGAN PRESERVATION SURGERY IN PATIENTS WITH LIVER CANCER: A CRITICAL REVIEW AND EVALUATION OF INNOVATIONS

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ABSTRACT

Liver cancer, especially hepatocellular carcinoma, is a leading cause of cancer death and is more common in patients with cirrhosis and chronic hepatitis. Innovative surgical techniques, such as anatomical resection and selective portal embolization, have been shown to be effective in preserving healthy liver tissue and reducing postoperative complications. Studies indicate improvements in survival and recovery rates, especially in cases of tumors located in areas that are difficult to resect. However, implementing these approaches requires expert centers and more research to validate long-term results.

Keywords: Liver cancer. Anatomical resection. Selective portal embolization. Organ-sparing surgery. Postoperative complications. Long-term survival.

INTRODUCTION

Liver cancer, particularly hepatocellular carcinoma (HCC), represents one of the leading causes of cancer death worldwide, with an increasing incidence, especially in patients with liver cirrhosis and chronic hepatitis. Traditionally, surgical treatment has been one of the most effective options for patients with localized liver cancer. However, liver resection surgery presents significant challenges, especially with regard to the need to balance tumor removal with the preservation of functional liver tissue. Extensive removal of healthy liver can result in liver failure, a serious complication that significantly affects postoperative morbidity and mortality.

Traditional surgical approaches, based on wide resections, are still widely used, but often result in substantial losses of liver tissue, increasing the risk of complications such as acute liver failure and infection. In response to these challenges, more innovative techniques have emerged in recent decades, with the aim of preserving a greater amount of viable liver tissue, reducing the risk of complications and improving postoperative outcomes. Among these new approaches, anatomical resection of the liver and selective portal embolization stand out, both of which have the potential to significantly improve clinical outcomes in patients with liver cancer.

OBJECTIVE

The aim of this study was to evaluate the impact of new surgical approaches, specifically anatomical resection and selective portal embolization, on the preservation of healthy liver tissue and the reduction of postoperative complications in patients with liver cancer. In addition, we sought to compare the outcomes of these approaches with the results of traditional surgical techniques.

METHODS

A systematic review of the literature was conducted in the PubMed, Scopus and VHL databases, using the descriptors "liver cancer", "anatomical resection" and "selective portal embolization". Studies published between 2015 and 2024 that addressed patients undergoing liver resections with a focus on the preservation of healthy liver tissue were included. The selection of articles was conducted according to the criteria of PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses). The analysis of the results was based on comparisons between traditional liver resection techniques and new surgical approaches, taking into account postoperative complications such as liver failure, infection, bleeding and mortality.

RESULTS AND DISCUSSION

Of the 25 studies included in the review, 15 studies showed that patients undergoing anatomical resection had a significant reduction of approximately 40% in postoperative complications compared with traditional resection techniques. This decrease was particularly observed in complications related to liver failure and the need for blood transfusions. In addition, anatomical resection has been shown to preserve an average of 35% to 40% of functional liver tissue, which directly contributed to faster recovery and lower risk of postoperative liver failure.

Selective portal embolization, which aims to induce hypertrophy of the remaining hepatic lobe prior to resection, has also been shown to be effective in improving postoperative liver function. In patients who received this technique, a preservation of healthy liver volume was observed, which contributed to the maintenance of liver function in the long term. The combined use of selective portal embolization and anatomical resection resulted in a reduced rate of liver failure in 25% of the patients analyzed.

In addition, most studies (18 out of 25) reported significant improvements in long-term survival rates, especially in patients whose tumors were located in hard-to-reach areas or in complex anatomical regions of the liver, such as the left and right lobes. These patients, who would traditionally have high rates of tumor recurrence and associated complications, demonstrated significantly better survival with the use of these new approaches. The anatomical resection technique, by allowing a more precise and controlled removal of the tumor, associated with the preservation of functional liver tissue, has the potential to reduce the rate of tumor recurrence.

LIMITATIONS AND FINAL CONSIDERATIONS

Despite the promising results, new surgical techniques, such as anatomical resection and selective portal embolization, still face significant challenges in terms of their large-scale implementation. The technical complexity of these approaches requires specialized training for the surgical team, as well as the availability of state-of-the-art equipment and advanced hospital infrastructure. Currently, these techniques are mainly available in specialized centers, limiting their access to a restricted number of patients.

In addition, although the reviewed studies have shown favorable results in terms of reducing complications and increasing survival, there is still a need for more multicenter, long-term studies to validate these findings. Combining innovative techniques with a personalized approach to liver cancer treatment may represent the future of liver surgery, but clinical implementation requires greater scientific evidence and specialized training.

CONCLUSION

New surgical techniques, such as anatomical resection and selective portal embolization, have been shown to be effective in reducing postoperative complications and preserving healthy liver tissue in patients with liver cancer. These approaches have been shown to improve survival and postoperative recovery rates, offering a promising alternative to traditional techniques, especially in patients with tumors located in areas that are difficult to resect. However, its implementation is restricted to specialized centers, and it is essential that surgical training be expanded, as well as hospital infrastructure, so that more patients benefit from these innovative techniques. Continued research and improvement of surgical technologies and approaches could expand treatment options for liver cancer, with a significant positive impact on patients' quality of life.