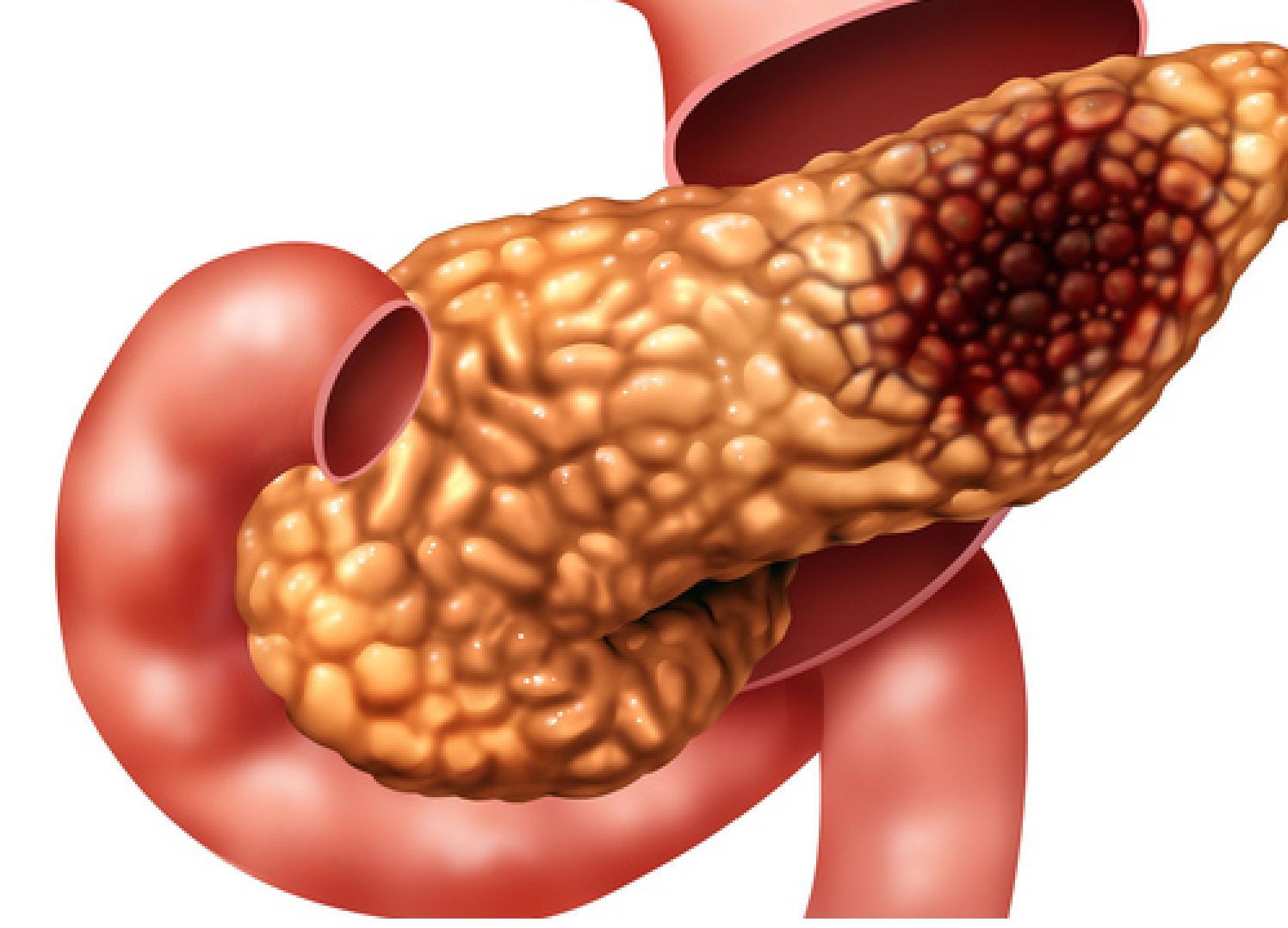




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Investigating the Efficacy of Cyberknife to Improve Survival in Advanced Pancreatic Cancer



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Introduction

Accounting for over 49,830 (7%) cancer-related deaths in the US, pancreatic cancer carries a dismal prognosis of median-survival of 6 months. As research on prolonging longevity continues, the advent of stereotactic-surgical techniques such as cyberknife has garnered attention in the scientific community for treatment of metastatic-pancreatic-carcinoma. This SR investigates the efficacy of the procedure.

Methods

- Databases reviewed: PubMed/Medline, SCOPUS, Web-of-Science (WOS)
- Timeframe: 2010-2023
- Types of studies: Randomised-controlled-trials, observational-studies, systematic-reviews, meta-analysis
- Search tool: MESH terminology
- Screening process:
 - Abstract and full-text screening
- Eligibility criteria per study type:
 - Observational-studies: STROBE guidelines
 - Review-articles: PRISMA guidelines
 - Narrative-studies: ENTREQ guidelines
 - Randomised-controlled-trials: Modified JADAD scale

Discussion

- CyberKnife procedures for pancreatic cancer yield competitive overall survival rates (53% to 82.1% at 1 year), surpassing surgery and conventional radiation therapy.
- Combining CyberKnife with chemotherapy significantly improves overall survival, as demonstrated by Lischalk et al. (2018) and Ji et al. (2021).
- CyberKnife treatment achieves a 4.8% conversion of unresectable tumors to resectable status, comparable to chemotherapy rates (3.8%).
- CyberKnife exhibits minimal acute toxicity, offering a well-tolerated option compared to surgery and conventional radiation therapy.
- CyberKnife demonstrates competitive overall survival rates, highlighting its promise for pancreatic cancer treatment.
- Inclusion of qualitative studies supports positive outcomes in overall survival, resectability conversion, and lower acute toxicity.
- Acknowledges limitations such as study heterogeneity and small sample sizes, emphasizing the need for high-quality studies to bolster result reliability.

Results

- Cyberknife shows promise in enhancing survival for advanced pancreatic cancer.
- Review of 12 studies on Cyberknife's impact on pancreatic cancer treatment.
- 8 studies provided data on survival rates and complications.
- Average one-year overall survival rate was 47.15%.
- Median overall survival spanned 11.38 months.
- Mean progression-free survival reported as 10.5 months.
- Mean local progression-free survival stood at 11.15 months.
- Duodenal ulcers were the most frequent complication observed.
- No other major complications were noted in the studies.

Author & Year	Country	N	Study Type	Key Findings on OS	Complications
Lischalk et al, 2018	USA	20	Retrospective	1-year OS: 53%	None reported
Goldsmith et al, 2018	UK	42	Retrospective	Median OS: 8.4 months	Grade 4 duodenal toxicities in 12.5%
Ji et al, 2021	China	89	Retrospective	1-year OS: 34% in SBRT+chemo group	Mild toxic effects; one case of grade 3 duodenal ulcer
Koong et al, 2020	USA	27	Retrospective	Median OS: 7 months; 1-year survival: 17%	Nausea in 7.5%, duodenal ulcer in 3.7%
Qing et al, 2021	China	16	Prospective Clinical Trial	Median OS: 14.5 months; 1-year survival: 68.8%	Common toxicities: hematologic, fatigue, nausea
Ren et al, 2020	China	73	Retrospective	Median OS: 15.6 months (MTV ≤ 12.2)	N/A
Shen et al, 2020	China	56	Retrospective	1-year survival: 82.1%; 2-year: 35.7%	Grade 3 and 4 gastrointestinal toxicities
Zheng et al, 2020	China	27	Prospective	1-year survival: 28%	Limited analysis due to sample size

Studies assessing the overall survival rate and complications associated with CyberKnife treatment of pancreatic cancer

Conclusion

Several studies report possible improvements in survival and conversion to resectable stage pancreatic cancer for patients undergoing cyberknife procedures. Most studies reported minimal acute toxicity and complications included nausea, fatigue, and duodenal ulcers. These results prompt further large-scale multi-center research to investigate the effectiveness in accordance with gender, race, and stage of diagnosis.