

Evaluating the Use of Hyperbaric Oxygen Therapy for Postoperative Ischemia in Breast Reconstruction: A Systematic Review

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Introduction

- Complications and poor outcomes following breast reconstruction are often related to tissue ischemia and subsequent necrosis of mastectomy skin.
- In recent years, the use of hyperbaric oxygen treatment (HBOT) has been shown to have promising therapeutic and protective effects against symptoms of post-operative breast tissue ischemia.
- This systematic review summarizes and assesses evidence on the role of HBOT in breast reconstruction patients in treating ischemic complications following surgery and/or radiotherapy.

Methods

- A comprehensive literature search was conducted in January 2023 using publications extracted from Pubmed, Scopus, Medline and CINAHL.
- Studies published after 2000 that investigated the impact of HBOT on post-operative outcomes of female patients undergoing implant or autologous breast reconstruction following mastectomy were included.
- Studies that had fewer than five patients, no full-text access, and/or were not in English were excluded.
- Systematic reviews and viewpoint articles were also excluded.

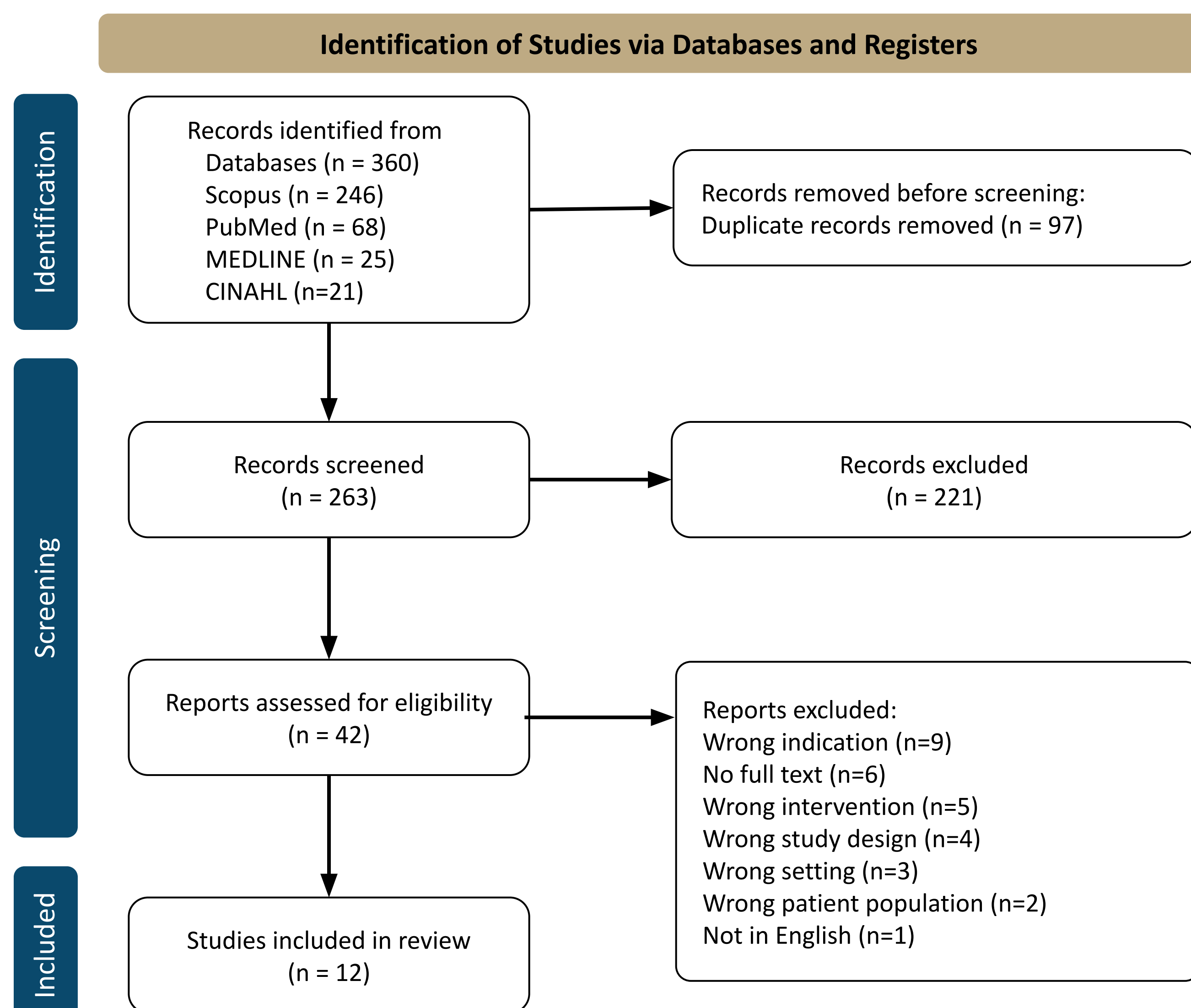


Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses Search Methodology. Three independent reviewers screened 360 articles in a standardized manner resulting in 12 studies to be included in this systematic review.

Results

Our initial search yielded 263 studies. After three stages of screening, four eligible studies were included. All four studies were retrospective case-control chart review studies of various sizes ($n \geq 7$ patients).^{1,2,3,4} Of these four studies, two investigated implant-based reconstruction only, one investigated autologous flap reconstruction only, and one investigated both types of reconstruction (*Figure 2*). Three of the four studies reported that HBOT had a significant advantage over alternative methods in reducing the risk of postoperative complications following post-mastectomy breast reconstruction, including successfully rescuing “at-risk” ischemic breast skin flaps and preventing subsequent ischemic necrosis.^{1,2,3} Contrarily, one study reported that HBOT did not make a statistically significant difference on ischemic nipples following nipple-sparing mastectomy, though did not negate its potential benefit (*Figure 3*).⁴ Generally, the studies found that initiating HBOT sooner rather than later following reconstruction and increasing the number of HBOT sessions administered were associated with improved clinical outcomes.

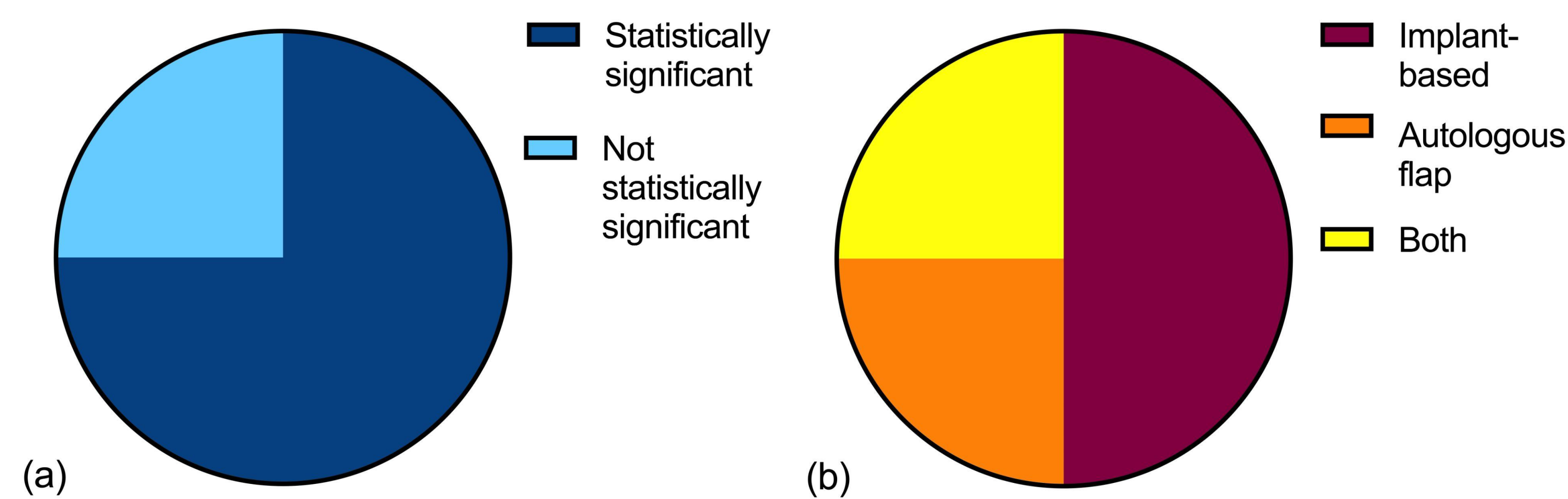


Figure 2: Breakdown of study screening results. All 4 studies suggested that HBOT had beneficial effects on tissue ischemia. (a) 3 out of 4 studies (75%) had statistically significant results, while 1 out of 4 (25%) did not. (b) 2 out of 4 studies (50%) investigated implant-based reconstruction cases only, 1 out of 4 (25%) investigated autologous flap reconstruction only, and 1 out of 4 (25%) investigated both types of reconstruction.

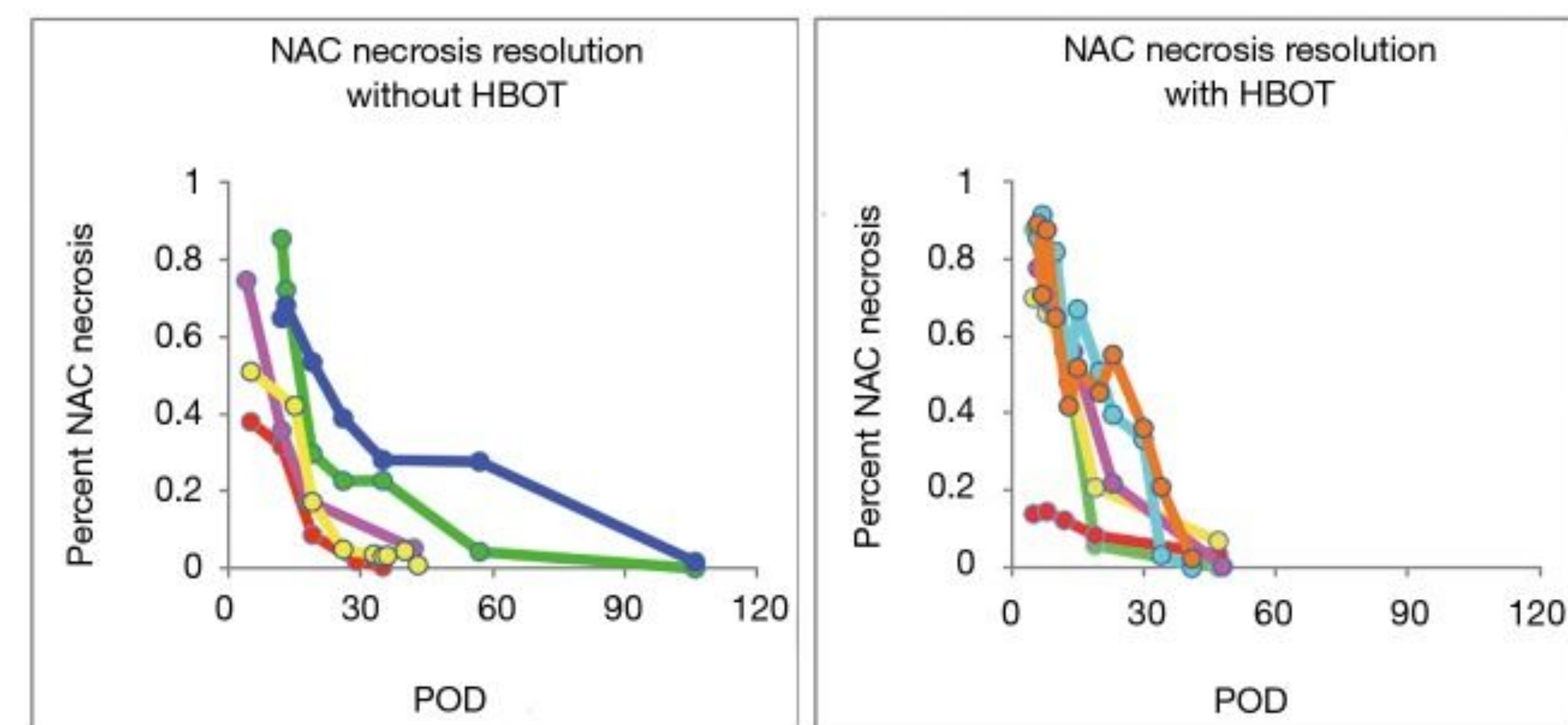


Figure 3: Length of time to complete healing without hyperbaric oxygen treatment and with hyperbaric oxygen treatment. The average number of days needed for the nipple-areolar complex to complete healing and show no signs of necrosis were 35.9 days with the use of HBOT and 65.4 days without HBOT. Although these results suggest an association between HBOT and its effect on healing time, they were not statistically significant due to the limited study sample size ($n=13$).³



Figure 4: Before and after hyperbaric oxygen treatment. (a) Breast two days post mastectomy and reconstruction (b) same breast after 20 treatments of HBOT (c) Breast three days post mastectomy and reconstruction (d) same breast after 22 treatments of HBOT.⁴

Conclusion

- This systematic review demonstrated that HBOT has shown to be advantageous at treating and preventing postoperative ischemic complications following breast surgery, though the current literature on this topic is sparse.
- Of the literature that currently exists, findings are notably limited by numerous factors including the studies’ small sample sizes, lack of standardized treatment algorithms and clinical endpoints, and absence of control groups.
- Additionally, as these studies speculated the cost-saving implications of HBOT but did not specify any actual or estimated cost savings, data analysis concerning HBOT-related cost savings is something that must be further explored.
- We believe that although the beneficial potential of HBOT in this context is promising, further investigation is warranted for more robust evaluation on its application.

References

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