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Can a nickel–titanium memory-shape device serve as a substitute for the stapler in gastrointestinal anastomosis? A systematic review and meta-analysis

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ABSTRACT

Background: Recently, a nickel–titanium (NiTi) memory-shape device has been successfully used in gastrointestinal anastomosis. The aim of this study was to investigate the feasibility and safety of the device.

Methods: Four databases, reference lists, and the World Health Organization International Clinical Trials Registry Platform were systematically searched for randomized controlled trials assessing the clinical efficacy of a NiTi memory-shape device compared with that of a stapler in gastrointestinal or colorectal anastomosis.

Results: Seven randomized controlled trials regarding the use of compression anastomosis clips (CACs) were enrolled for meta-analysis. The use of CACs was associated with a significant reduction in hospital duration (mean = −0.88 d; 95% confidence interval [CI], −1.38 to −0.38), the time to flatus (mean = −0.36 d; 95% CI, −0.08 to −0.04), and the start of oral intake (mean = −0.45 d; 95% CI, −0.83 to −0.06), as well as a nonsignificant change in postoperative complications and mortality. These clinical outcomes did not significantly change with the use of compression anastomosis rings.

Conclusions: Colonic anastomosis with a CAC is likely to reduce hospital duration, time to flatus, and the start of oral intake without influencing mortality or postoperative complications and may be a safe and preferable choice in colonic anastomosis. Further well-designed trials should be performed to determine the safety and efficacy of the newly developed compression anastomosis ring in both ileocolic and colorectal anastomosis.

1. Introduction

The physical apposition of the bowel is achieved either by the placement of hand-sewn sutures or by the mechanical application of metal staples. Currently, the overwhelming majority of surgeons perform gastrointestinal anastomosis using surgical staplers rather than hand sutures because of their quick application and reduced rate of anastomotic

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Table 1 – Inclusion and exclusion criteria in the review.

Study characteristics	Inclusion criteria	Exclusion criteria
Population	Adult Undergo digestive surgery	Children Animal data
Study type	RCTs	Reviews/editorials/ case reports Cohort/cross-over/ nonrandomized studies
Intervention	CAC/CAR *versus* stapler	BAR/AKA/suture
Outcomes of interest	At least one of the following outcomes: Mortality Length of hospital stay Gas started Start of oral intake Costs Duration of surgery Bowl started	

leakage [1,2]. Although there is a significant body of literature supporting the use of surgical staplers, they suffer from several inherent limitations. They are limited by their potential for incomplete sealing due to their full-thickness insertion and potential to induce inflammation via the introduction of foreign material [3]. These disadvantages result in complications, as shown by the consistently reported rate of anastomotic leakage after colorectal resection ranging from 2.9%–15.3% [4], whereas the incidence of stenosis or stricture varies from 1.2%–4.2% overall [5]. In addition, the penetration of the bowel by staplers is associated with increased infections of the wound and

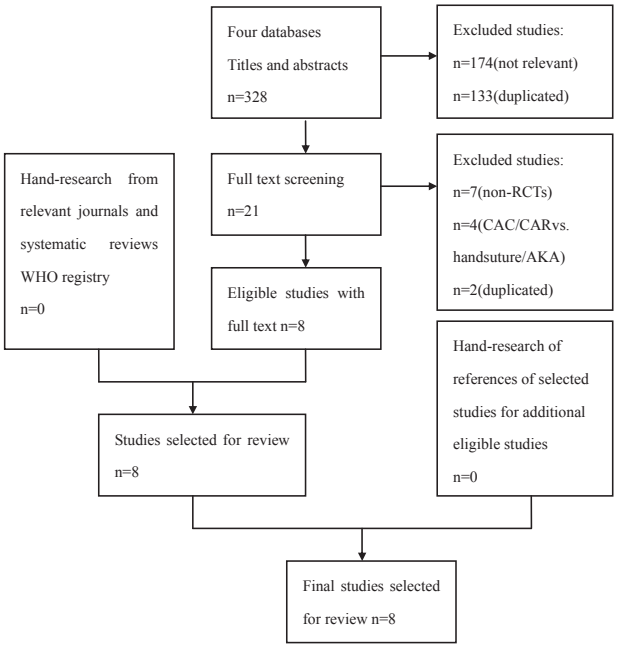

Fig. 1 – Summary of study identification and selection. WHO = World Health Organization.

Table 2 – Characteristics of select studies.

Author	Year	Country	Sample size	Study type	Anastomosis site and type	Type of operation	Devices		Dropouts	Follow up time (mo)	Time of expel (d)
Nudelman	2002	Israel	20	RCT	Colonic, side to side	Colonic cancer	CAC	Stapling	0	6	5–7
Nudelman	2004	Israel	10	RCT	Colonic, side to side	Laparoscopic colectomy	CAC	Stapling	0	6	5–7
Nudelman	2005	Israel	60	RCT	Colonic, side to side	Elective colonic	CAC	Stapling	0	6	7–10
Jiang	2006	China	40	RCT	Jejunum-jejunum, side to side	Total gastrectomy for gastric tumor	CAC	Stapling	0	1–6	11 ± 2.5 (9–16)
Wang	2008	China	40	RCT	Gastroenterostomy, side to side	Gastrectomy for gastric tumor	CAC	Stapling	0	1–3	10–30
Liu	2008	China	66	RCT	Gastroenterostomy/ enteroenterostomy, side-to-side	Gastrectomy for gastric tumor or ulcer	CAC	Stapling	0	6	15.1 ± 6.04 (5–29)
Hua	2011	China	51	RCT	Gastroenterostomy, side to side	Open abdominal surgery	CAC	Stapling	0	1	11 ± 2.3 (9–15)
Li	2011	China	60	RCT	Colorectal end to end	Colectomy and anterior resection	CAR	Stapling (29 mm)	0	3	11.3 ± 8.9 (7–16)