

Purpose

Usage of a four-quadrant endoscopic biopsy protocol is currently the gold standard for the detection of intestinal metaplasia and/or dysplasia in patients with suspected or established BE. The usage of computer-assisted brush biopsy (WATS^{3D}) has been associated with increased diagnostic yields (DY) for intestinal metaplasia (IM) and dysplasia. We performed a systematic review and meta-analysis to determine the additional yield for detection of intestinal metaplasia and dysplasia associated with the addition of computer-assisted brush biopsy (WATS^{3D}).

Methods

We performed a search of the medical literature using PUBMED (1950-present), SCOPUS, and meeting abstracts from Digestive Disease Week and the American College of Gastroenterology (2010-2013). We included randomized controlled trials or case-control studies assessing the incremental benefit of WATS^{3D} in addition to standard endoscopic biopsy in patients undergoing screening for BE, surveillance, or post-ablation surveillance examinations. The search included the following terms: Barrett's esophagus, esophageal neoplasms, computer-assisted imaging processing, and gastroesophageal reflux. We used Comprehensive Meta-Analysis (CMA Version 3.0, Biostat Inc., Englewood, NJ) software to generate Forest plots of pooled prevalence rates with 95% confidence intervals (CIs). A random effects model was used to provide a more balanced estimate of the effect size using a logarithm of the diagnostic yield. We assessed heterogeneity by using the I² statistic with a threshold of > 50% and the X² test with a p value <0.10 to define statistically significant heterogeneity. The primary endpoint of the analysis was the additional DY of BE and/or dysplasia associated with the addition of WATS^{3D} to standard forceps biopsy.

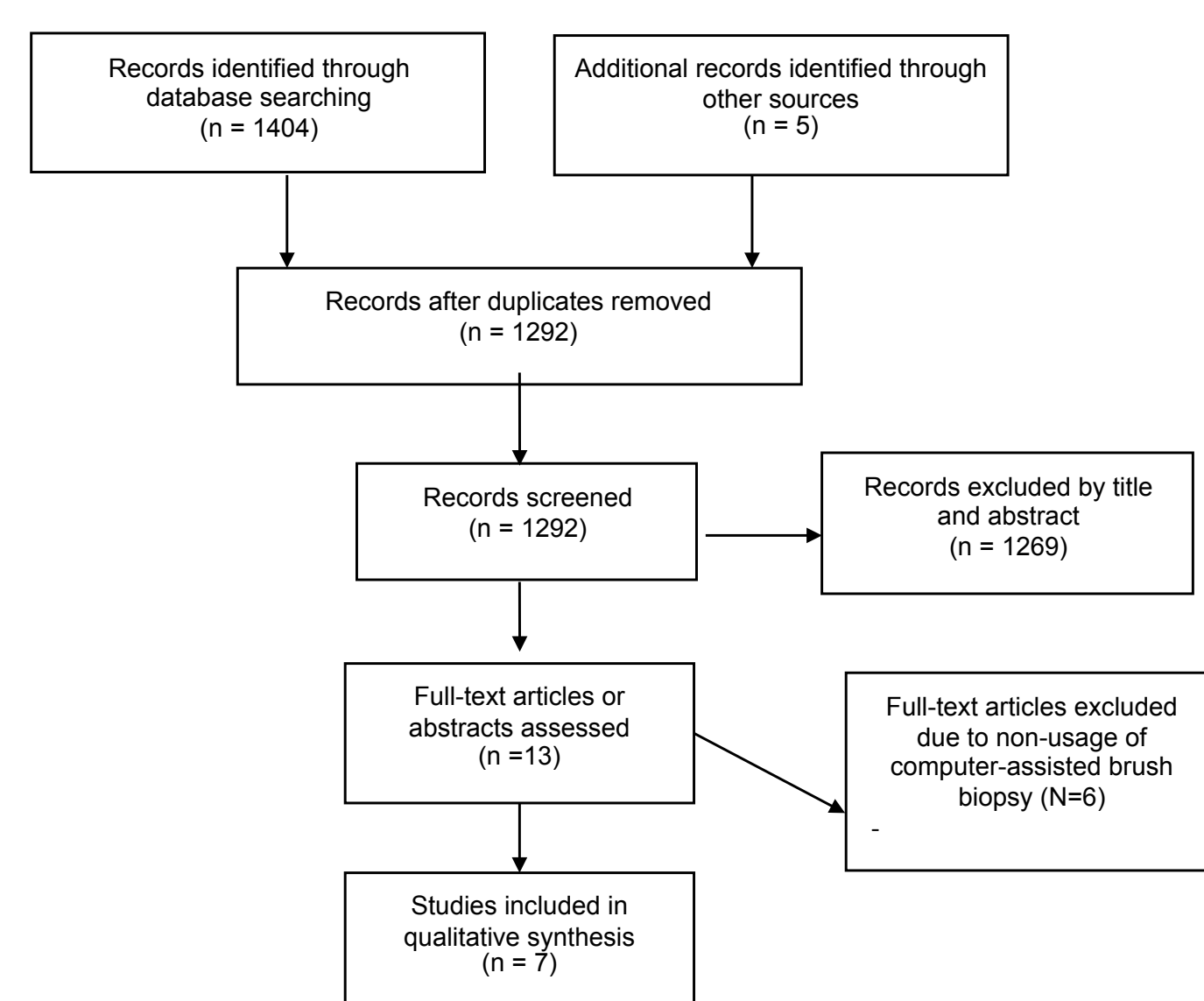


Figure 1. Flow Diagram of Studies Identified in the Systematic Review

Results

The search identified 1415 articles, 1408 were excluded. Two full articles and 5 abstracts were included. The population for the analysis included 893 patients undergoing endoscopic screening for BE (1 article and 1 abstract), and 806 patients undergoing surveillance for BE. (3 studies included BE patients enrolled in surveillance and 3 studies patients post-ablation). Characteristics of the studies are shown in Table 1. The median scale on the Newcastle-Ottawa scale was 3 (range 3-5).

Author (Year)	Center (s)	Type	Patients	No. Pts	Mean Age	% Male	Added DY BE	FB BE*	WATS BE*	NNT BE	Added DY Dysplasia
BE Screening											
Johanson, 2011	Multicenter	Article	Screening	858	58	54%	101	145	160	8.4	7
Kataria, 2012	Single	Abstract	Screening	45	52	38%	7	20	19	6.4	0
BE Surveillance											
Johanson, 2011	Multicenter	Article	Surveillance	418	58	54%	38	206	165	11	7
Anandasabapathy, 2011	Multicenter	Article	Surveillance	151	65	82%	N/A			N/A	
Marino, 2012	Single	Abstract	Post-Ablation Surveillance	40	70	92%	10	13	23	4	1
Kataria, 2013	Single	Abstract	Post-Ablation Surveillance	33	61	71%	6	6	7	5.5	N/A
Tsynman, 2013	Single	Abstract	Post-Ablation Surveillance	12	79	91%	3	4	7	4.0	N/A
Gross, 2013	Multicenter	Abstract	Surveillance	152	61	61%	14	70	69	11	1

Table 1. Characteristics of Included Studies in the Systematic Review

Increased DY IM (%)	Publication Type	No. Pts	Increased DY IM%	95% CI	I ²	p value
Overall	1 article 5 abstract	1548	42%	21-82%	98%	0.0
Screening	1 article 1 abstract	893	68%	52-88%	95%	0.0
Surveillance	1 article 1 abstract	570	19%	13-27%	0%	0.6
Post-Ablation	3 abstracts	85	83%	37-184%	69%	0.04
Increased DY Dysplasia (%)	Publication Types	No. Pts	Increased DY Dysplasia	95% CI	I ²	p value
Overall	2 articles 2 abstract	761	30%	16-55%	95%	0.0
Surveillance	2 articles 1 abstract	721	36%	15-64%	97%	0.0
Post-Ablation	1 abstract	40	20%	5-155%	27%	0.24

Table 2. Results of the Meta-Analysis

The results of the meta-analysis are shown in Table 2. Overall, the increased number of IM cases detected using WATS in addition to forceps biopsy was 115 cases per 1000 patients, with the highest event rates demonstrated in patients undergoing screening or post-ablation surveillance. The calculated number to treat (NNT) was approximately 9 patients. Overall, the heterogeneity was significant (I²=95%, p=0.0). The funnel plot was examined and did not reveal significant asymmetry. The Begg and Egger test results (p=0.37 and p=0.63 respectively) also did not suggest the presence of publication bias.

Using percentage of increased diagnostic yield as the primary outcome, the overall percentage increase using WATS was 42% (95% CI 21-82%), ranging from 19% for the two surveillance studies to 83% for 3 abstracts examining rates post-ablation. In the 4 studies (761 patients) reporting the increased percentage diagnostic yield for dysplasia, the increased DY was 30% (95% CI 16-55%). The number needed to treat (NNT) to detect an additional case of BE ranged from 4.0-11 based on 7 studies.

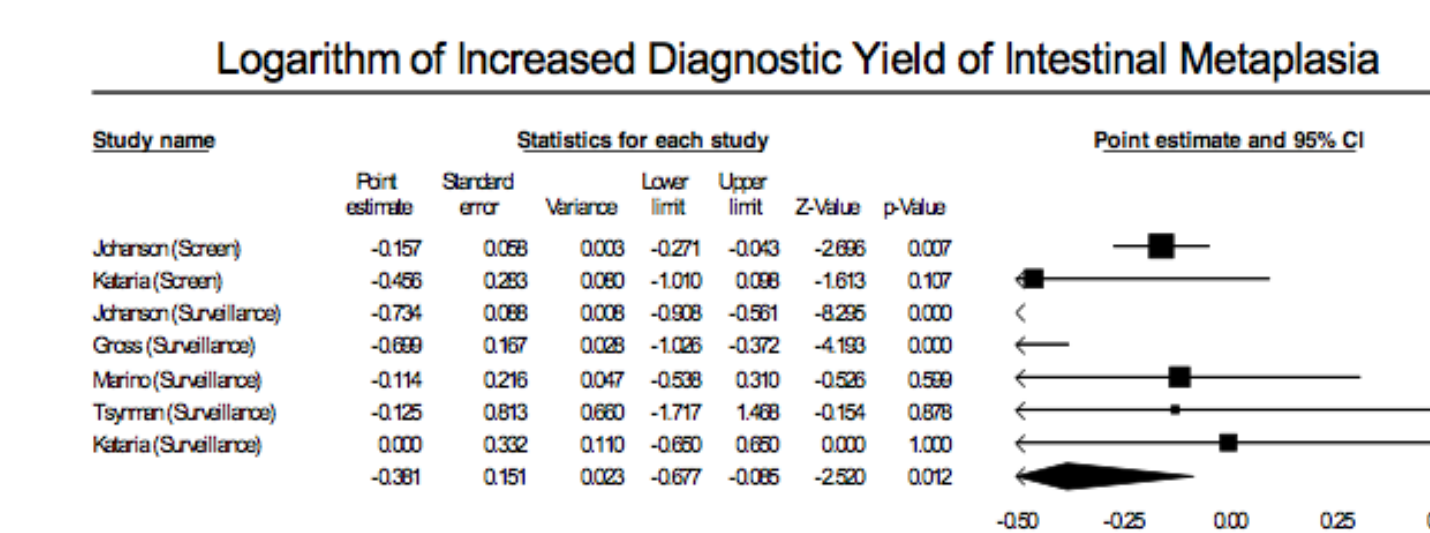


Figure 1. Increased Diagnostic Yield for Intestinal Metaplasia

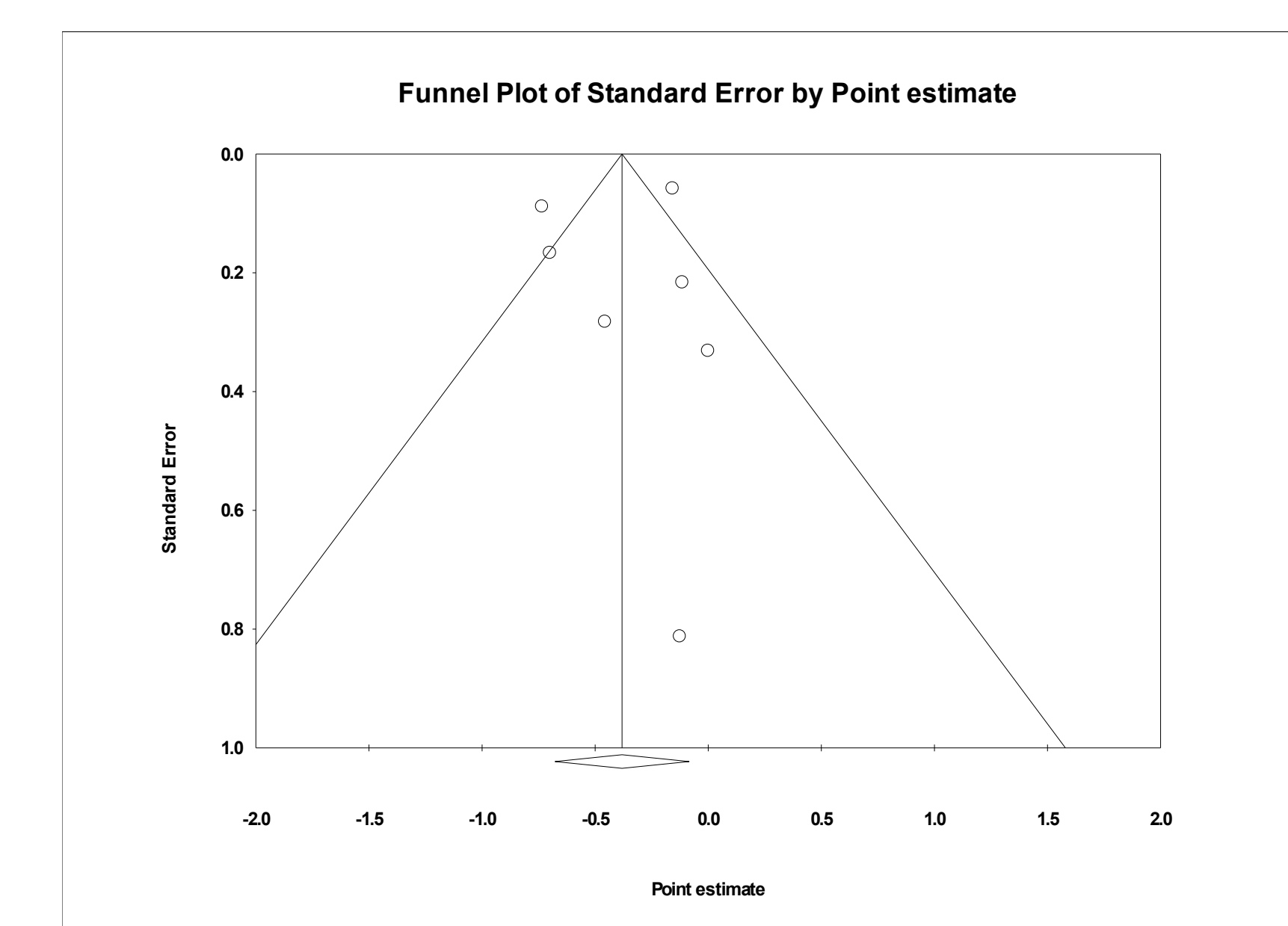


Figure 2. Funnel Plot for Studies Examining Yield for IM Detection

Conclusions

- The addition of WATS^{3D} to standard forceps biopsy increases the diagnostic yield for BE and dysplasia in patients undergoing both screening and surveillance.
- The increased yield was highest for patients undergoing screening for BE or post-ablation examinations.
- The number needed to treat (NNT) to detect an additional case of Barrett's Esophagus ranged from 4-11 based on the 7 available studies.

References

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