Is jumbo biopsy forceps comparable to cold snare for diminutive colorectal polyps? – a meta-analysis

ABSTRACT

Background and study aims Diminutive colorectal polyps are increasingly being detected and it is not clear whether jumbo biopsy forceps (JBF) has comparable efficacy to that of cold snare polypectomy (CSP) for management of these lesions.

Methods An electronic literature search was performed for studies comparing resection rates of JBF and CSP for diminutive polyps (≤5 mm). The primary outcome was incomplete resection rate (IRR). Secondary outcomes included failure of tissue retrieval and complication rates (post-polypectomy bleeding, perforation etc.). Leave-one-out analysis was performed to examine the disproportionate role of any of the studies. Meta-analysis outcomes and heterogeneity (I²) were computed using Comprehensive meta-analysis software.

Results A total of 4 studies (3 randomized controlled trials and 1 retrospective study) with 407 patients and 569 total polyps (mean size of 3.62 mm) was included for analysis. IRR of JBF was slightly higher than that of CSP (10.2 % vs 7.2 %) but this was not statistically significantly different (Pooled OR 1.76; 95 % CI 0.94 – 3.28; I² = 0). Leave-one-out analysis showed no significant difference in the pooled OR comparison either. Two of the 4 studies reported 0 % failure of tissue retrieval for JBF and 1 % and 4.3 % for CSP. There were no complications for either group from the 2 studies that reported this outcome. The quality of the included studies was moderate to high.

Conclusions This systematic review with only limited data shows that JBF and CSP are not statistically different in completely removing diminutive polyps, although careful endoscopic assessment is needed to ensure complete removal of all polyp tissue.

Introduction

Colorectal cancer (CRC) is the 2nd leading cause of cancer in both men and women in the United States [1]. Screening colonoscopy helps to identify precancerous colorectal polyps and their prompt removal could prevent malignant transformation. According to the current guidelines, endoscopic polyp size measurement is key in determining surveillance intervals. Small (<10 mm) and diminutive (≤5 mm) colorectal polyps are the most common type of colorectal polyps found during colonoscopy especially when using higher resolution endoscopes, distal attachment devices and improvements in bowel preparation [2].

While it is known that the neoplastic potential of these small and diminutive polyps is low, studies have shown that incomplete (or inadequate) polyp resection could contribute to post
colonoscopy colon cancer in up to 30% of patients [1]. Incom-
plete resection rates (IRR) of 10% to 15% have been reported
for standard capacity biopsy forceps, cold snare (CSP) and hot
snare across polyps of all sizes [3]. Studies have demonstrated
that the resection rates of these diminutive polyps by hot biop-
sy forceps are suboptimal compared to cold techniques [4].
However, there is some degree of variation in the resection
rate among cold polypectomy techniques itself. CSP appears
to be safer as well as more effective than standard capacity for-
ceps in the management of small and diminutive polyps [4].

Jumbo biopsy forceps (JBF), a type of cold forceps which in
comparison to standard capacity forceps and large capacity
forcecs, can accommodate more polyp tissue (12.44 mm$^3$ vs
7.22 mm$^3$) and offer removal of diminutive polyps in entirety.
A meta-analysis from 2016 [5] suggested that cold snare or
jumbo biopsy decreased the rates of incomplete resection by
60% without any increase in procedure time. However, none of
the studies included in this analysis were from a head-to-head
comparison.

Recently, some studies [6–8] have been published examin-
ing JBF to CSP for efficacy in diminutive polyp resection. How-
ever, variable rates have been reported, and it remains unclear
which method is better. Since diminutive polyps are a common
occurrence in screening and surveillance colonoscopy, knowl-
edge of effective polypectomy techniques is crucial. We per-
formed a systematic review and meta-analysis of the literature
to examine the efficacy and safety of JBF and CSP in the man-
agement of diminutive polyps.

Methods
We performed this systematic review and meta-analysis in
accordance with the PRISMA guidelines [9]. The search strategy
for screening, excluding and final selection of studies is depic-
ted in Fig. 1.

Literature search
We searched online electronic libraries (PubMed, EMBASE, Web
of Science, Google Scholar) until February 1$^{st}$, 2020 for studies
comparing JBF and CSP and resection of diminutive colorectal
polyps. The following keywords “jumbo biopsy forceps”, “cold
snare polypectomy”, “small polyps” and “diminutive polyps”.

Eligibility
We primarily included articles that reported diminutive polyp
resection data using jumbo biopsy forceps AND cold snare (in-
clusion criteria). Case reports, case series, cross sectional stud-
ies and review articles were excluded for this review and analy-
sis.

Screening and data collection
Articles were screened and data was extracted by one reviewer
(SS) and verified independently by another reviewer (MD). Du-
PLICATE studies were excluded, and titles/abstracts were
screened for study of interest. Only articles that met eligibility
were included for final review and analysis

Quality assessment of studies
Cochrane risk of bias tool [10] was used to assess the quality of
RCTs while Newcastle Ottawa scale (NOS) [11] was used to ex-
amine study quality of the retrospective cohort study. Scoring
was done per protocol across all the respective domains.

Definitions
Incomplete resection rate—reflects the number of polyps in-
completely resected (i.e. with residual neoplastic tissue left be-
hind) divided by the total number of polyps resected
Failure of tissue retrieval rate – rate at which the polyp/tis-
sue attempted to be resected and retrieved was not successful
Complications – any untoward event that occurred as a di-
rect result of the endoscopic procedure and/or related instru-
mentation.

Outcomes
The primary outcome of interest was the pooled IRR of JBF and
CSP when treating diminutive polyps. Secondary outcomes in-
cluded failure of tissue retrieval, long-term follow up outcomes
and complications rates following use of either modality (post-
polypectomy bleeding, perforation etc.)

Statistical analysis
Pooled estimates using proportions from each group were
compared using a fixed-effects model with odds ratio (OR) and
95% CI. Leave-one-out analysis was performed to examine a disproportionate role of any single study. P<0.05 was considered statistically significant.

Results

Characteristics of included studies

The initial search yielded 201 articles. After removal of duplicates, there were 73 articles that were eligible for review. Of these, 61 were removed after review of the title, six of the abstract and two articles were excluded after full review, respectively, since they did not meet inclusion criteria. Finally, four articles were included for review and meta-analysis.

Of the four included articles, three were RCTs [6–8], with one study as abstract only data [7] and one was a retrospective cohort study [12]. One of the studies [7] had a non-inferiority study design while the others seemed to have followed convenience sampling. Another study that was included [8] was abstract only (interim data from 2010) and there was no record of a full publication.

There were 407 patients with 569 total polyps (mean size 3.62 mm) reported from the included studies. Of these, 61 were removed after review of the title, six of the abstract and two articles were excluded after full review, respectively, since they did not meet inclusion criteria. Finally, four articles were included for review and meta-analysis.

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Quality assessment of the studies

All of the RCTs included were at low risk of bias for randomization, incomplete data or selective data reporting. None of the studies were blinded. The retrospective study was high (score 7) on the Newcastle Ottawa scale (Table 2). Publication bias was not examined due to only four eligible studies.

Discussion

In this meta-analysis of four available studies, there was no statistically significant difference noted in the incomplete resection rates of JBF and CSP when removing diminutive polyps. Because only three small RCTs were involved, it is too early to conclude whether either method fares better to remove diminutive polyps or that they indeed can both be used. It is imperative to note that with either method there is a substantial incomplete resection rate (7%–10%) and careful examination of the post-polypectomy site is essential even when a diminutive polyp is removed.

With the improving detection modalities (higher resolution endoscopes, artificial intelligence etc.) detection of smaller polyps is and will be increasingly seen. While it is known that the overall risk of malignant transformation of small and diminutive polyps is low (<1%) [13], it nevertheless puts a burden on the health care system (procedure/resection cost and pa-
thology expenses) in addition to the risk of complications from the procedure itself.

The safety and efficacy of CSP have been established and it is currently the most preferred modality of resection of diminutive polyps [5]. Hot forceps even though currently approved
have shown significantly higher IRR (up to 53 %) [14] making them less effective. Cold forceps fair better in comparison [14] but the literature is sparse comparing them to JBF. The wider jaw (8.8 mm) of the JBF with a better bite makes it likely to grasp more tissue and thus have a lesser IRR compared to the standard biopsy forceps [15]. This way resection margins of removed tissue could be examined better for clean resection margin to ensure adequacy of resection as well. This meta-analysis supports the comparable nature of JBF and CSP in addressing these polyps.

It is worthy of mention that one of the studies [7] intended to evaluate non-inferiority of JBF over CSP but the other studies did not have any such hypothesis. It is unclear, but unlikely that this has any impact on pooled results since results were generated using events of outcome and total subjects. However, this could play a role towards the final results as a power required to detect a non-difference could be very different from a power required to detect a difference. In leave-one-out analysis, we were not able to detect this effect, but this could still be possible.

A large number of polyps (n = 569), low heterogeneity ($I^2=0$) and the quality of studies included are the strengths of these studies. Some of the limitations pertain to that of any meta-analysis, i.e. that it reports pooled data only and might be subject to skewing owing to some of the included studies. Another limitation is the total number of included studies (n = 4). Of these, one of the studies [8] was abstract only data and it is possible that the full text had some additional information that could change the reported results. Of the four studies that met eligibility, three were RCTs and were of reasonably high quality. While we did include a cohort study thus raising a concern for potential confounding bias, restricting the analysis to RCT alone did not change the results. We were not able to conduct further analysis of certain factors (viz. residual and recurrence rates, change in surveillance intervals and time required for effective polypectomy) because of lack of information from the included studies. There was also no information on whether polyps were removed en-bloc or use of any special techniques (lift and cut, etc.). The studies lacked information on long-term follow-up data making the above-mentioned calculations not possible. Future studies should focus on accuracy of resection methods from either technique and rate of (long-term) residual and recurrent polyp to further define their efficacy.

**Conclusion**

In conclusion, based on the findings, jumbo biopsy forceps seem not statistically different to cold snare polypectomy in the management of diminutive polyps. Further head to head large scale trials are necessary to find any small difference that would have been masked by prior studies with focus on diminutive polyps to avoid incomplete resection and improve quality of colonoscopy.

**Competing interests**

The authors declare that they have no conflict of interest.

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