

# Comparison of plastic and self-expandable metal stents in the palliative treatment of malignant biliary obstruction: a meta-analysis

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**Abstract Objective:** Stent placement is one of the main methods in the palliative treatment of malignant biliary obstruction, including plastic and self-expandable metal stents. The comparison of stent patency between self-expandable metal and plastic stents in palliation of malignant biliary obstruction is meaningful. We carried out a meta-analysis to summarize current evidence for clinical efficacy of self-expandable metal and plastic stents in the treatment of malignant biliary obstruction. **Methods:** A comprehensive search of several databases including CNKI, Wanfang Data, Sino MED. A fixed-effects or random-effects model was used to pool data of all study endpoint. Sensitivity analysis was also performed. **Results:** Eight randomized clinical trials were identified, including 633 patients. These results suggested that the self-expandable metal stents were associated with a significantly longer stent patency (OR = 8.15; 95% CI: 2.80–23.76; I<sup>2</sup> = 85%). No publication bias was observed. **Conclusion:** Self-expanding metal stents have a longer patency than plastic stents and offer adequate palliation in patients with malignant biliary obstruction.

**Key words** ERCP; stent placement; malignant biliary obstruction; meta-analysis

Cholangiocarcinoma is the main pathogeny of malignant biliary obstruction, and most of patients have been advanced when were diagnosed, losing the chance to surgery [1]. Endoscopic retrograde cholangiopancreatography (ERCP) is not only used to diagnose biliary tract diseases such as stone, stricture, but also can be a treatment of these diseases, success rate of which is about 95% [2]. Stent placement through ERCP has been very common since it was first introduced in 1980, and, nowadays, it has been the normal treatment of advanced malignant biliary obstruction [3–4]. This therapy is less hurt them than surgery, accords with normal physiological feature, and can relieve obstruction effectively so that raise the patient's quality of life [5]. The stents can divide into two types: plastic stents and self-expanding metal stents (SEMSs). Some studies [5–9] indicated that SEMSs could get longer drainage time than plastic stents, but had no different from survival time; other studies [10] indicate that SEMSs are more effective than plastic ones in relieve obstruction and the total cost is less than plastic ones in the long term. Debate is still exist about the choose of stent, so

we gather, arrange and analysis the data of that SEMS or plastic stent placement treats advanced malignant biliary obstruction, then, compare the effect of two therapies.

## Materials and methods

### Search strategy

A computerized medical literature search was performed by using CNKI (1915–2014.2), Wanfang Data (1998–2014.2), Sino MED (1978–2014.2). Search words are “ERCP”, “endoscopic”, “stent”, “malignant”, “biliary obstruction”, “randomized”, and “RCT”.

### Select rule

Inclusion criteria: All randomized controlled trials comparing the effect of self-expandable metal and plastic stent placement are included; the trials which couldn't extract data or be repeated are excluded. Selected people: People diagnosed advanced malignant biliary obstruction, age ≥ 18 years old and planning to get the treatment stent placement through ERCP are included; people proved to have other reasons to explain abnormal liver function (virus, alcohol, drug, and idiopathic abnormal liver function), people who couldn't tolerate ERCP because of seri-

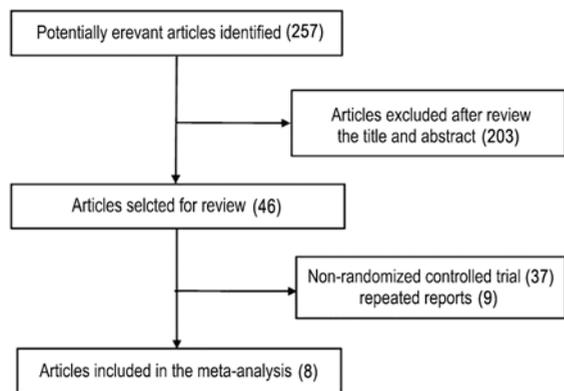


Fig. 1 Searching procedure

ous diseases, or people who are allergic constitution are excluded.

**Intervention method**

Divided the patients into two groups: SEMSs group (EMBE group, putting self-expandable metal stents through ERCP) and plastic stent group (ERBD group, putting plastic stents through ERCP), fasting, rehydration, anti-inflammatory, symptomatic treatment after stent placement.

**Quality evaluation of literature**

Scoring articles according to Jadad Scale, articles scoring 1–3 are low quality, scoring 4–7 are high quality.

**Statistical analysis**

Rev Man 5.2 was used to analysis the data. Before the meta-analysis, heterogeneity across studies was determined. If  $P > 0.1$ ,  $I^2 < 50\%$ , it means that heterogeneity have no statistical significance, so we choose fixed effect model to combine the effect size; if  $P \leq 0.1, I^2 \geq 50\%$ , it

means that heterogeneity have statistical significance, so we choose random effect model to combine the effect size, when necessary, subgroup analysis, sensibility analysis will be made. Effect size was calculated as odds ratios (ORs) and 95% confidence intervals (CI) for enumeration data.  $P < 0.05$  means that it has statistical significance.

**Results**

**Searching procedure**

A total of 257 articles was searched by computer, 203 of which was eliminated by reading the titles and abstracts, and 46 articles was eliminated through read the whole passage, including 37 non-randomized controlled trial, and 9 repeated reports. Finally, 8 randomized controlled trials [5–12] were adopted, including 633 stent-placement patients (Fig. 1).

**Literature feature**

Factors are similar in the 8 articles such as age, sex, and medical history. In 633 patients, 331 of them used plastic stents, 302 of them used metal stents. Factors of patients such as age, sex, and medical history are similar in the 8 articles. All of articles had inclusion criteria and 2 of them had exclusion criteria; 3 of them reported the loss to follow-up, 2 of 3 explained the reason. We score articles according to Jadad Scale, the scores of the 8 articles are 2–3.

**Comparison of the first stents occlusion rate**

OR (odds ratio) and 95% CI of the cumulative obstruction of the first stent data of every study was list as Fig. 2 ( $I^2 = 85\% > 50\%$ , random effect model), OR of every study is between 1.15–51.43. In first stents, the occlusion rate of plastic stents is obvious higher than SEMSs (66.8% vs. 27.2%,  $P < 0.00001$ ).

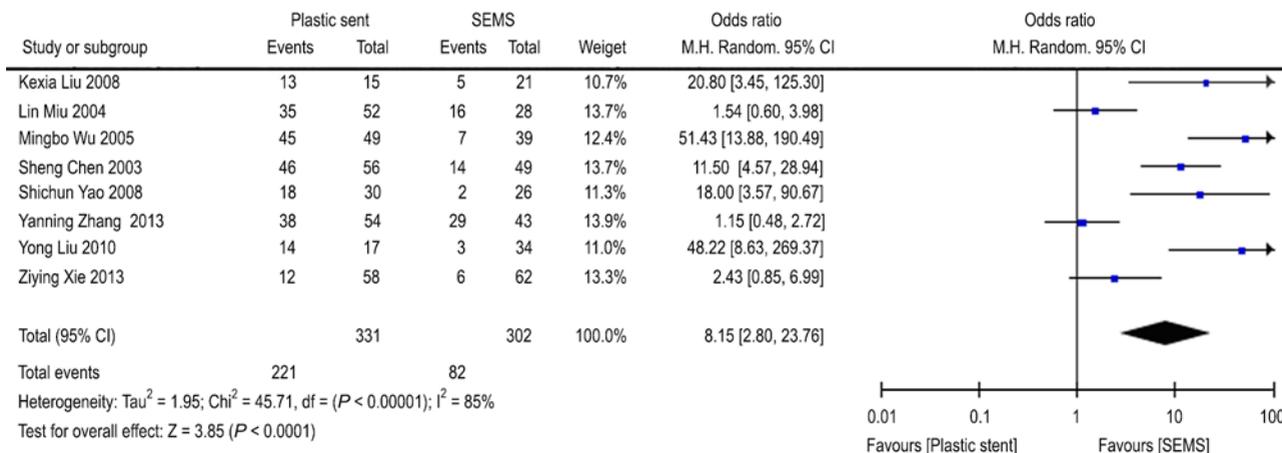


Fig. 2 Comparison of occlusion rate between the first plastic and metal stents

## Sensibility analysis

After we ruled out a study, the pooled estimates of stent occlusion rate, number of reintervention and survival were still significant. The result was the same as before.

## Publication bias

Regarding to every study endpoints, the funnel plot made by Rev Man 5.2 provided no evidence of publication bias. Fig. 3 showed the funnel plot of publication bias analysis on the cumulative patency of the first stent data.

## Discussion

Most patients with malignant obstructive jaundice are in the terminal stage of cancer when they see the doctor, losing the chance to surgical extirpation. Palliative treatment is the only way to relieve jaundice, raising the patient's quality of life. Effective biliary drainage is the most important method of palliative treatment. Conventional treatments are surgical operation and interventional radiology palliative internal and external drainage. But most patients can't tolerate because of too weak condition, furthermore, the effect of drainage is not satisfactory. Stent placement through ERCP has many advantages such as less injury, more fitting physiological characteristics, relieving jaundice, and raising the patient's quality of life [13].

There are two types of stent, plastic ones and SEMs. According to the analysis above, SEMs have longer patency than plastic ones. SEMs have mesh structure making tumor cell and other things not easy to attach, so that they get longer patency, and fit patients who were anticipated longer survival time. Meanwhile, the SEM is more expansive, so we must consider patient's economic condition when choose stents. It is reported that the cost of choosing SEMs is no more than choosing plastic stents for patients who were anticipated longer survival time in the long run [10, 14-15]. Plastic stents are easy to obstruct,

always need reintervention and result in much cost for repeated hospitalization. So SEMs seem to be ideal stents for the treatment of malignant hilar biliary obstruction compared with plastic stents. However, for the patients who were extremely old or anticipated very short survival time, palliation with plastic stent is effective enough [16].

In this meta-analysis, we searched all articles of Chinese database, but did not search for English database, so it is stand for Chinese present situation about stent placement in the palliative treatment of malignant biliary obstruction. We have used Rev Man 5.2 to estimate the publication bias and do sensitivity analysis. Publication bias was not observed and sensitivity analysis showed that our inclusions of every study endpoints were significant.

## Conflicts of interest

The authors indicated no potential conflicts of interest.

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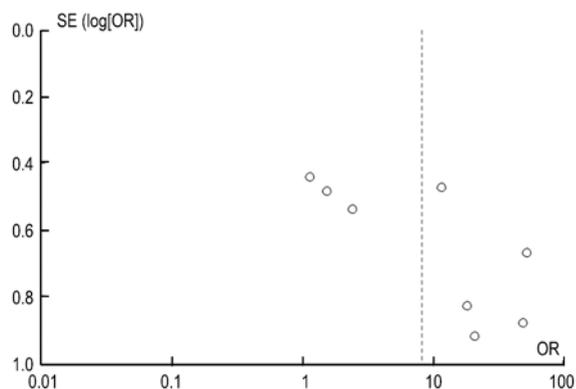


Fig. 3 Funnel plot for publication bias

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