Review

Risk factors for dislocation after revision total hip arthroplasty: A systematic review and meta-analysis

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HIGHLIGHTS

- Many risk factors have been identified for the dislocation following revision THA. However, these factors are still undergoing controversial or have been not been well summarized.
- Constrained liner, trochanteric osteotomy, Cup inclination, cup anteversion, BMI, single component revision were not found to be risk factors.
- History of instability and prior revisions are the most consistently significant risk factors for dislocation after revision THA.

ARTICLE INFO

ABSTRACT

Background: No formal systematic review or meta-analysis was performed up to now to summarize the risk factors of dislocation after revision total hip arthroplasty(THA).
Aims: The present study aimed to quantitatively and comprehensively conclude the risk factors of dislocation after revision total hip arthroplasty.
Methods: A search was applied to CNKI, Embase, Medline, and Cochrane central database (all up to October 2016). All studies assessing the risk factors of dislocation after revision THA without language restriction were reviewed, and qualities of included studies were assessed using the Newcastle–Ottawa Scale. Data were pooled and a meta-analysis completed.
Results: A total of 8 studies were selected, which altogether included 4656 revision THAs. 421 of them were cases of dislocation occurred after surgery, suggesting the accumulated incidence of 9.04%. Results of meta-analyses showed that age at surgery (standardized mean difference −0.222; 95% CI -0.413 −0.031), small-diameter femoral heads (≤28 mm) (OR 1.451; 95%CI 1.056−1.994), history of instability (OR 2.739; 95%CI 1.888−3.974), number of prior revisions ≥ 3 (OR, 2.226; 95% CI, 1.569−3.16) and number of prior revisions ≥ 2 (OR 1.949; 95% CI 1.349−2.817), acetabular components with elevated rim liner were less likely to develop dislocation after revision THA (OR 0.611; 95% CI 0.415−0.898).
Conclusions: Related prophylaxis strategies should be implemented in patients involved with above-mentioned risk factors to prevent dislocation after revision THA.

1. Introduction

Postoperative dislocation remains as one of the most common complications following revision total hip arthroplasty (THA), with reported incidences ranging between 4 and 30% [1,2]. Several patient- and surgery-specific risk factors have been described previously, including femoral head size, deficient abductors, surgical approach, malposition of components, using of a liner with an

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elevated rim, cup position, and number of previous hip surgeries [3–7]. Identifying risk factors for this complication is important, as the identification of patients at risk can assist with preoperative patient education and management at the time of revision surgery. However, these studies had some limitations, such as a small sample and containing a single or very few potential risk factors in the individual study. In addition, some results obtained from individual studies were inconsistent and even contradictory. Thus, it is still uncertain whether these identified factors from individual studies are able to predict dislocation after revision total hip arthroplasty.

Until now, no formal systematic review or meta-analysis was performed to summarize the risk factors of dislocation after revision THA to obtain a definitive conclusion. Therefore in this study, we summarized these risk factors from the previous original researches and conducted a meta-analysis. It would be most informative in guiding clinicians for identifying high risk patients and helping them preventing postoperative dislocation after revision THA to improve the patients' prognosis.

2. Materials and methods

2.1. Literature search

CNKI, Embase, Medline, and Cochrane central database were searched using a broad range of terms to identify original research, published all through October 2016 and selecting potential studies to consider. The main key words were as follows: "factor" or "predictor" or "risk" AND "dislocation" or "luxation" AND "hip arthroplasty" or "THA" AND "revision". Also, a manual search of references in the identified articles and systematic reviews was performed for possible inclusion.

2.2. Eligibility criteria

Two reviewers (Yan Jiang Yang and Biao An) independently evaluated the titles and abstracts of the identified studies. Only full-text articles without language restriction were included in this meta-analysis. The following inclusive selection criteria were applied: (1) a study was performed to explore risk factors for dislocation occurrence after revision THA; (2) cases and controls were defined based on the presence or absence of dislocation, respectively; (3) sufficient data were published for estimating an odds ratio (OR) or hazard ratio (HR) or standardized mean difference (SMD) with 95% confidence interval (95% CI).

2.3. Quality of included studies

The quality of the included studies was evaluated using the Newcastle–Ottawa Scale (NOS) [8]: based on the three main items: the selection of the study groups (0–4 points), the comparability of the groups (0–2 points) and the determination of either the exposure or the outcome of interest (0–3 points), with a perfect score of 9.

2.4. Data extraction

All the data were carefully extracted from all eligible studies independently by the two reviewers (Yan Jiang Yang and Biao An). The following variables were extracted from each study: first author's name, publication year, country, significant risk factors, definitions and numbers of cases and controls and numbers of citations for each potential risk factor for dislocation after revision THA. Any disagreement was resolved by discussion and consensus.

2.5. Statistical analyses

ORs or SMDs and corresponding 95% CI were estimated and pooled across studies to assess the association between different variables and the risk of dislocation with a value of $P < 0.05$ as significance. Heterogeneity among studies was tested by Q-test statistics with significance set at $P < 0.10$ [9] and further measured by I^2 statistics with I^2 more than 50% indicating significant inconsistency. A random-effect model was used to calculate pooled ORs in the case of significant heterogeneity ($P<0.10$ or $I^2>50\%$); otherwise, a fixed-effect model was used [10]. The outcome of meta-analysis for variables was summarized graphically using a forest plot. If necessary, a sensitive analysis by excluding outlier study one by one was conducted to investigate the sources for heterogeneity. Potential publication bias was detected by Begg's funnel plots, and $P < 0.05$ was judged as statistically significant. All analyses were performed by the software Stata 11.0 (Stata Corporation, College Station, TX).

3. Results

3.1. Characteristics of identified studies

Fig. 1 indicates the flowchart of the article screening and the detailed selection process. Initial search yielded 221 titles and abstracts from the electronic databases. After duplicates were removed, 125 abstracts were reviewed for initial screening and 38 for the next stage of review. After inclusion and exclusion criteria were applied, 8 full text articles were chosen for this meta-analysis. All of them were published in English with publication time from 2002 to 2016. These 8 studies altogether included 4656 patients with hip fracture; 421 cases of dislocation occurred after surgery, suggesting the accumulated incidence of 9.04%. Detailed information about these included studies is shown in Table 1.

3.2. Methodological quality assessment

The outcome of methodology quality assessment was as follows: one studies [11] scored 9, two studies [3,4] scored 8, three studies [5,7,12] scored 7, and two studies [6,13] scored 6.

3.3. Age and gender

Two studies reported the admission age of 64.25 years in postoperative dislocation patients, which was 1.05 years younger than that in nondislocation groups, and the pooled results for meta-analysis suggested a difference (SMD -0.222; 95% CI −0.413 to −0.031). There was no evidence of heterogeneity among studies ($P = 0.567$, $I^2 = 0$; Table 2). Sex difference of the occurrence of dislocation after revision total hip arthroplasty was reported in 7 studies. Results of meta-analysis suggested no significant difference.

3.4. Femoral head size

Postoperative dislocation incidence was consistently higher in those who had small-diameter femoral heads (≤ 28 mm) compared with those who had large-diameter femoral heads (≥ 32 mm). A total of 3 studies reported the small-diameter femoral head as a risk factor and meta-analysis of these studies showed that patients with small-diameter femoral heads were more prone to develop dislocation after revision total hip arthroplasty (OR 1.451, 95% CI 1.056–1.994). There was no evidence of heterogeneity among studies ($P = 0.222$, $I^2 = 33.6\%$; Table 2; Fig. 2a).