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Depression and anxiety before and after limb length discrepancy correction in patients with unilateral developmental dysplasia of the hip

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ABSTRACT

Objective: Limb length discrepancy (LLD) is common in patients with developmental dysplasia of the hip (DDH) and may influence the psychological status of these patients. The present study aims to investigate depression and anxiety in DDH patients with different extents of LLD and to assess the effect of LLD correction on these two psychological factors.

Methods: 161 patients with DDH were recruited and divided into two groups based on whether they could perceive LLD preoperatively. The patients who could not perceive LLD were assigned to group N, and those who could perceive LLD were assigned to group P. Depression/anxiety, Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores and LLD were assessed one week before, six months and two years after total hip arthroplasty (THA).

Results: Depression and anxiety were significantly higher in group P patients compared to group N patients. The patients in group N presented significant improvement in depression and anxiety six months after arthroplasty, while DDH patients in group P did two years after arthroplasty. Correlation analyses revealed their improvement was associated with pain relief and improved hip function in both groups of patients and was also related to changes in the perception of LLD in group P patients.

Conclusions: Depression and anxiety levels were higher in DDH patients with perceived LLD. Their improvement was related to pain relief and improved hip function following THA. In DDH patients with perceived LLD, a change in the perception of LLD also played a part in their improvement.

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1. Introduction

Developmental dysplasia of the hip (DDH) is a common congenital skeletal anomaly. The incidence of DDH varies from 0.1% to 1.84% in the Caucasian population and 0.1%–0.5% in the Chinese population [1]. Persistent DDH can induce chronic hip pain and dysfunction and increase hip osteoarthritis risk [2]. In DDH patients, total hip arthroplasty (THA) has been considered the most successful intervention for secondary hip osteoarthritis, as it relieves pain and improves hip function and quality of life [3–6]. However, patients' psychological status plays an important role in their satisfaction with the intervention. Studies have reported the influence of psychological factors in patients undergoing total knee arthroplasty (TKA) and THA [3,4]. Patients with higher depression and anxiety often report lower satisfaction with these surgical treatments [5,6]. The evaluation of patients' preoperative psychological

status helps predict their satisfaction with the orthopedic outcomes of THA and serves as the basis for psychological intervention during treatment.

Studies have reported significant improvements in health-related quality of life after orthopedic surgery in patients with DDH [7–9]. However, the psychological status of patients before and after arthroplasty is less frequently described. Long-term psychological adjustment has been reported for children treated for congenital dislocation of the hip [10], and the psychological characteristics of patients with congenital dislocation of the hip who were treated with THA has also been described [11]. Depression and anxiety following THA has also been examined in patients with DDH [8]. However, the authors did not take into consideration the variation in disease severity among the patients. Patients with DDH suffer from different degrees of dislocation, ranging from hip dysplasia to hip dislocation. The level of pain, the physical function of the hip and the limb length discrepancy (LLD) that results from hip dislocation may also vary.

LLD could be perceived or not by patients. DDH patients with non-perceived LLD experience pain and hip dysfunction caused by secondary osteoarthritis in their 30s or 40s. DDH patients with perceived LLD suffer perceived LLD from birth, which later presents as a limp, and the patients suffer severe pain and limited hip motion from secondary

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osteoarthritis. Pain and hip dysfunction are believed to affect patients' quality of life and psychological status [12]. Because perceived LLD can influence patients' daily lives [13], we speculated that LLD might exert a negative effect on patients' psychological status. Furthermore, patients with DDH exhibit different degrees of LLD; thus, their psychological status might differ.

The effects of LLD that arise after THA have been extensively studied [14–17] and have been demonstrated to influence patients' satisfaction and quality of life. LLD, which is congenital in patients with DDH, can be fully or partially corrected by THA when secondary hip osteoarthritis occurs. How preoperative LLD correction influences depression and anxiety and changes the perception of LLD is rarely reported. The aim of this study was to investigate the depression and anxiety status of DDH patients with perceived and non-perceived LLD before and after THA and to assess the effects of LLD correction by THA on patients' psychological status.

2. Patients and methods

2.1. Patients

The study was a prospective cohort study, and the patients were recruited from two major hospitals. Patients with unilateral DDH who underwent primary THA between March 2008 and August 2010 in these two hospitals were recruited. The indications for THA were severe hip pain or limited mobility. The inclusion criteria were as follows: primary THA for unilateral DDH patients, over 18 years of age, intellectual and linguistic ability to complete questionnaires. The exclusion criteria were as follows: previous hip surgery, other previous surgery and presence of other disease. The research staff identified patients who met the eligibility criteria, who were then invited to participate.

2.2. Methods

The study was approved by the local medical ethics committee (one hospital, No. HH2008-017; the other hospital, No. XJSH2008-023). All of the patients provided their informed consent to participate. Clinical data, including sex, age, body mass index (BMI), and education, were collected. The diagnosis of DDH was based on clinical records and plain radiography [18]. The patients indicated whether they could perceive LLD preoperatively, at 6 and 24 months after surgery. LLD was measured using pelvic radiograph pre- and postoperatively [19]. To assess the reproducibility of the LLD measurements, 40 patients were randomly chosen. The LLD measurements were performed independently by two observers who were blinded to their own data and to each other's data. The first observer performed the measurements twice at an interval of three weeks, and the second one performed the measurements only once. Intra-observer and inter-observer variability in the LLD measurements were assessed using intra-class correlation coefficients. According to the classification system of Crowe et al. [20], the severity of DDH ranges from class I to IV, with class IV exhibiting the most severe dislocation. In the current study, the patients with preoperatively perceived LLD were assigned to group P, and those with non-perceived LLD were assigned to group N.

Before the operation, preoperative planning was conducted to determine the suitable components for each patient. All operations were performed via a posterolateral approach. The acetabular reconstruction was in the anatomical position. In the group N patients, the surgery was performed using the conventional THA technique; in the group P patients, femur osteotomy was performed in 8 patients whose LLD was more than 4 cm to avoid vascular nerve injury. In group P, one patient experienced dislocation after the operation and was successfully treated with a closed reduction, and in another patient, sciatic nerve palsy appeared after the operation and recovered five months later. In group N, three patients experienced intraoperative femur fractures that healed within 3 months after the operation.

Chinese psychological assessment questionnaires and the hip Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) questionnaire [21] were administered to the participants one week before surgery, six months and two years after surgery. The patients' satisfaction with pain relief, stiffness, functional improvement and LLD correction were assessed at the same time points.

The State-Trait Anxiety Inventory (STAI) [22] was adopted and translated into Chinese to assess the patients' anxiety. The questionnaire consists of 40 items: half of the items measure anxiety as a trait (STAI-T), and the remaining measure anxiety as a state (STAI-S). The patients' depression was assessed using the Beck Depression Inventory (BDI) [23], a commonly used 21-item self-reported measurement of common cognitive, affective and vegetative symptoms of depression. The range of severity for each item is reflected by four self-evaluative statements (0 is the least severe and 3 is the most severe).

Hip symptoms were assessed using the WOMAC score, which is a self-administered multidimensional index that contains three dimensions: pain (five items), stiffness (two items), and function (17 items). Each item is represented by a Likert scale that ranges from 0 (best health state) to 4 (worst health state). The raw scores were transformed into a so-called normalized 0 to 100 scale, with 0 being the worst; and 100, the best [21].

The self-administered patient satisfaction scale [24,25] is a 4-question instrument that is specifically designed for patients undergoing total joint arthroplasty. Participants are questioned about their satisfaction with pain relief, work activities, recreational activities, and the overall procedure. In the current study, the items for work activities and recreational activities were replaced with physical function and LLD improvement. The scale score was the mean of the scores from the individual items, which ranged from 25 (least satisfied) to 100 (most satisfied). All scores were normalized to a 0 to 100 scale (100 = best health state).

2.3. Statistical analysis

The normality of the data distributions were tested with a Kolmogorov–Smirnov test. When making comparisons of tested data, non-parametric tests were used for non-normally distributed data, and parametric tests were used for normally distributed data. Two-tailed tests were used when comparisons were made between groups or between different time points within the same group at different time points. Dependent *t*-tests were used for comparisons of the preoperative and postoperative questionnaire data. Independent *t*-tests were employed to examine inter-group differences. Wilcoxon tests were used for comparisons of preoperative and postoperative LLD and to compare LLD between the groups. Patients' pain, stiffness, hip function and satisfaction with the LLD correction were assessed at two years after THA, and the impact of these measures on the psychological factors were assessed using Pearson correlation analysis. *P* values below 0.05 were considered statistically significant. All statistical analyses were performed with SPSS 13.0 (SPSS, Chicago, IL).

3. Results

One hundred sixty-one patients (29 males and 132 females) were recruited in the study and completed the questionnaire before surgery. Eighty patients were categorized as group N; and 81, as group P. There were no significant differences with respect to sex ratio, age or BMI between the two groups ($p < 0.05$) (Table 1). Fig. 1 presents a flow chart that illustrates the study procedures and population. The reproducibility of the LLD measurements was acceptable; the inter-observer correlation coefficient was 0.87, and the intra-observer correlation coefficient was 0.91.

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