



## Multicentre study to evaluate the clinical effects of laparoscopic uterine artery occlusion in combination with myomectomy to treat symptomatic uterine leiomyomas



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### ABSTRACT

**Objective:** Uterine artery occlusion is often used to treat symptomatic uterine myomas, as this is a minimally invasive approach. However, alternative methods for uterus-sparing therapy are in development. This study aimed to compare the clinical effects of laparoscopic uterine artery occlusion (LUAO) in combination with laparoscopic myomectomy (LM) with LM alone for the management of symptomatic uterine leiomyomas.

**Study design:** This multicentre study was a retrospective controlled investigation. In total, 618 patients with symptomatic uterine myomas from six hospitals in Eastern China underwent LUAO + LM or LM alone between June 2011 and December 2012. Operative time, blood loss, transfusion, highest temperature, postoperative hospital stay, complications and follow-up results were compared between the two groups.

**Results:** Complete clinical data were available for 504 patients. Among these, 324 patients underwent LUAO + LM and 180 patients underwent LM alone. Mean  $\pm$  standard deviation blood loss, transfusion, highest peri-operative temperature and duration of hospital stay were significantly lower in the LUAO + LM group compared with the LM group ( $83.61 \pm 53.70$  ml vs  $109 \pm 58.43$  ml, 1.85% vs 6.11%,  $37.6 \pm 0.40$  °C vs  $37.9 \pm 0.45$  °C and  $5.11 \pm 0.62$  days vs  $6.10 \pm 0.83$  days, respectively). The mean duration of follow-up was  $38.97 \pm 5.82$  months in the LUAO + LM group and  $37.30 \pm 2.25$  months in the LM group ( $p > 0.05$ ). The relief of abnormal uterine bleeding, reduction of uterine volume and recurrence of myomas were more remarkable in the LUAO + LM group than the LM group (97.22% vs 83.75%, 62.42% vs 51.83% and 3.47% vs 10.63%, respectively).

**Conclusions:** LUAO in combination with LM was associated with higher surgical quality, greater relief of abnormal symptoms and less recurrence of myomas compared with LM alone. LUAO in combination with LM is recommended for women with symptomatic uterine myomas who wish to preserve their uterus.

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### Introduction

Uterine leiomyomas represent one of the most common gynaecological tumours in women of reproductive age, with a prevalence of 77% [1]. The standard treatment for symptomatic

myomas is either hysterectomy or conservative myomectomy for women who wish to preserve their fertility [2,3]. Minimally invasive uterine-sparing surgical treatments have been developed over the last decades to enable women to retain their uterus, preserve future fertility and avoid the impact of a hysterectomy on sexual function and mental discomfort [4,5]. Both uterine artery embolization (UAE) and laparoscopic uterine artery occlusion (LUAO) are popular and effective for the treatment of symptomatic myomas, and are beneficial in terms of blood loss, hospital stay and recovery [6–9]. However, UAE has been associated with complications such as vaginal discharge,

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pain, abnormal uterine bleeding (AUB), fever and higher risk of necrosis of the uterine cavity compared with LUAO [10–15]. LUAO has been associated with lower patient satisfaction and higher short-term re-intervention, clinical failure and hysterectomy rates in women with symptomatic uterine fibroids compared with UAE and myomectomy [16].

Since 2000, the authors have performed LUAO in combination with laparoscopic myomectomy (LM) to manage symptomatic myomas. LUAO + LM has been found to lead to less blood loss, relief of menorrhagia (97.1%), reduced uterine volume (48.9%) and a significant decrease in the recurrence of myomas (3.0%) [17]. Similar outcomes have been reported by other authors [18–22]. As such, the use of LUAO + LM as conservative management for uterine myomas is popular and its use is increasing. Since 2010, this approach has been adopted in other medical institutions in Eastern China, and a multicentre group was established. Data for patients with myomas who underwent LUAO + LM or LM alone were collected and compared. The aim of this study was to assess the clinical effects and feasibility of LUAO + LM to treat symptomatic uterine myomas.

## Materials and methods

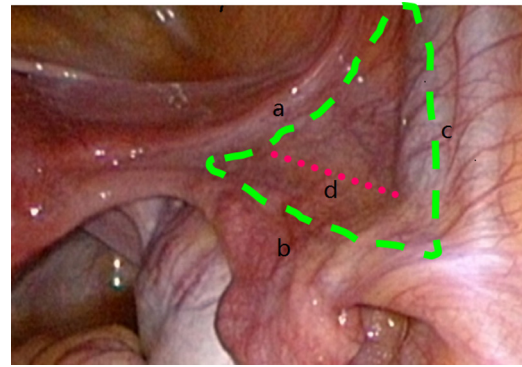
### Patients

This multicentre study was a retrospective controlled investigation. Six hospitals in Eastern China took part in the study. Enrolled patients were informed about the content of the study, and specimens were obtained after the patient's informed consent form had been signed. The trial was approved by the Ethical Committee of Yangpu Hospital, Tongji University of Medicine School. Patients received their first surgical treatment of LUAO + LM or LM alone due to symptomatic myomas >3 cm between June 2011 and December 2012. If the patient did not wish to preserve their fertility, LUAO + LM was recommended. Patients who wished to preserve their fertility underwent LM alone. All patients underwent a pre-operative ultrasound examination to determine the location, number and size of myomas. Exclusion criteria for this study were as follows: history of gonadotrophin-releasing hormone treatment in the last year, and malignant conditions (e.g. leiomyosarcoma) confirmed by postoperative pathological results. Demographic data were compared between the two groups.

### LUAO and LM

LUAO procedures were performed by senior gynaecologists. Using technological cooperation and communication, the multicentre members received training from our hospital for at least 3 months until they were able to perform LUAO + LM independently and skilfully. LUAO was performed in the different centres in accordance with a unified procedure, as described elsewhere [17]. The peritoneal incision was made in the triangular area surrounded by the round ligament of the uterus, the infundibulopelvic ligament and the external iliac vessels (Fig. 1). The segment of the vessel where the uterine artery originates from the anterior branch of the internal iliac artery was separated and exposed, and used as the point of arterial occlusion. The characteristics of this location (including diameter of approximately 2–6 mm, tortuous shape and vessel pulse) were advantageous for identification of the uterine artery under laparoscopic vision. Bipolar electric coagulation or a PK knife was used to block the uterine artery, with power between 40 and 45 W and band width of coagulation of 1–1.5 cm. In the women who underwent LUAO + LM, LUAO was performed prior to LM.

LM was performed as follows. The pseudocapsule and the myometrium covering the myoma were incised using an acusator



**Fig. 1.** Peritoneal incision for uterine artery occlusion. (a) Round ligament of uterus; (b) infundibulopelvic ligament; (c) external iliac vessels; (d) peritoneal incision.

until the myoma was visually exposed. The superficial capsule of the myoma was pushed off, and the myoma was separated from the myometrium using a dissector. Enucleation of the myoma was completed, and the defect was repaired with a continuous running suture [17].

### Operative parameters and follow-up

Operative parameters including operative time, blood loss, transfusion, specimen weight, highest temperature, time of intestinal recovery, length of postoperative hospital stay and complications were recorded and compared between the two groups. The surgical time was recorded by the anaesthetist. Blood loss was calculated according to the volume of suction minus the amount of washing. Postoperative temperature was monitored every day, and the highest temperature in the week following surgery was recorded. Peri-operative complications included vaginal bleeding, deep vein thrombosis, intestinal obstruction and urinary system injuries.

From June to August 2015, follow-up examinations were performed. Patients were asked to return to hospital by letter or telephone. The interval from the date of surgery to the date of follow-up was defined as the time of follow-up. The patient was asked whether abnormal symptoms such as AUB and pelvic pressure had been relieved. Sonography was performed to detect the size of the uterus and possible recurrence of myomas. Uterine volume was calculated and compared with the pre-operative volume. When a myoma  $\geq 3$  cm was found, it was regarded as recurrence. Recurrent cases and subsequent re-interventions were recorded.

### Statistics

Statistical Package for the Social Sciences Version 19.0 (IBM Corp., Armonk, NY, USA) was used for statistical analysis. Data were presented as mean  $\pm$  standard deviation or percentages. Continuous variables were compared using the unpaired *t*-test, and categorical variables were compared using Chi-squared test or Fisher's exact test, as appropriate.  $p < 0.05$  was considered to indicate statistical significance. The risk of recurrence was calculated and described using Kaplan–Meier curves.

## Results

In total, 618 patients with myomas underwent surgical treatment. Of these, 504 patients with complete operative and follow-up data were recruited into the study. Three hundred and twenty-four women underwent LUAO + LM and 180 women underwent LM alone (Table 1). The general characteristics of the

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