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Original article

The relationship between torsion and of the length of the peduncle in patients with uterine subserosal leiomyoma

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ABSTRACT

Objective: To clarify the characteristics of twistable pedunculated subserosal uterine leiomyomas.

Methods: A retrospective study was conducted of female subserosal uterine leiomyoma patients who were treated by laparoscopic myomectomy at Showa University Hospital, Tokyo, Japan, between January 2011 and September 2015. The patients were classified according to their intraoperative findings. The maximum diameter and volume of the subserosal uterine leiomyoma, and the length and thickness of the peduncle were evaluated by magnetic resonance imaging, and torsion and nontorsion cases were compared.

Results: A total of eight torsion cases and 20 nontorsion cases were analyzed. The average peduncle length was significantly higher in the torsion cases (18.7 ± 3.5 mm) than in the nontorsion cases (9.0 ± 3.9 mm). The maximum diameter and volume of subserosal uterine leiomyoma and the thickness of the peduncle did not differ between the groups. The length to thickness ratio (length to thickness index) was more clearly associated with the torsion than the length of the peduncle or the ratio of the maximum diameter of the leiomyoma to the length. Receiver operating characteristic curve analysis showed that a length to thickness ratio of > 1.0 was associated with a higher detection rate, with an area under the receiver operating characteristic curve of 0.95 (95% confidence interval 0.86–1.00, $p < 0.001$).
Conclusions: In the preoperative period, the length of the peduncle was associated with the subsequent occurrence of torsion in patients with subserosal uterine leiomyoma. The length to thickness index is useful for predicting the torsion of a subserosal uterus leiomyoma.

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Introduction

Uterine leiomyoma is the most common gynecologic neoplasm. In most cases, its diagnosis is easy and definitive. Cases with uterine subserosal leiomyoma are usually asymptomatic. However, the torsion of subserosal uterine leiomyoma may cause acute low abdominal pain and intra-abdominal hemorrhage, and requires emergency surgery. Torsion of the peduncle of a subserosal leiomyoma first interrupts the venous and then the arterial blood flow,

leading to the extravasation of blood and then to gangrene.¹ In rare cases, when nonspecific abdominal pain occurs, torsion may be overlooked, leading to the degeneration of the leiomyoma and adhesion to other structures. If we predict the torsion of subserosal uterus leiomyoma, we can recommend an operation before clinical manifestations appear.

Since torsion rarely occurs in patients with subserosal uterine leiomyoma, preoperative diagnosis is difficult. The literature includes only a small number of case reports,^{2–4} and no reports that include the detailed characteristics of subserosal uterine leiomyoma in which the peduncle can easily be twisted. We hypothesized that pedunculated subserosal uterine leiomyomas in which the leiomyoma is large or in which the peduncle is long and thin would be easily twisted.

The purpose of the present study was to clarify the characteristics of subserosal uterine leiomyoma with a twistable peduncle.

Conflicts of interest: The authors declare no conflicts of interest in association with this study.

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Materials and methods

A retrospective study was conducted of female subserosal uterine leiomyoma patients who were treated by laparoscopic myomectomy at Showa University Hospital, Tokyo, Japan, between January 2011 and September 2015. All patients provided written consent for research purposes after the completion of the clinical procedures. This study was approved by the ethics committee of Showa University Hospital.

The patients were classified according to the confirmation of torsion during surgery. The diagnosis of torsion was peduncle twisted by $> 360^\circ$. The diagnosis of a pedunculated subserosal uterine leiomyoma was made based on the intraoperative video findings and the observation of the beak sign and the bridging vascular sign on magnetic resonance imaging (MRI).^{5,6} The data that were collected included patient demographics, physical and clinical characteristics, and preoperative MRI findings before torsion. The MRI findings included the maximum diameter (cm) and volume (cm^3) of the leiomyoma, and the length (mm) and thickness (mm) of the peduncle. The maximum diameter adopted the maximum diameter in three orthogonal cross sections. The length of the peduncle was measured between the subserosal leiomyoma and the uterus, and the thickness of the peduncle was measured in the middle of the peduncle (Figure 1). These measurements were performed by a radiologist and a gynecologist.

Pairwise comparisons were made between the torsion and the nontorsion groups in terms of patient age, height, weight, primigravida status, nulliparous status, gonadotropin-releasing hormone agonist use, and the MRI findings. Student *t* test was used in the comparison between the two groups, and the Chi-square test was used to compare distribution. Receiver operating characteristic

(ROC) curves were calculated to analyze area under the curve (AUC) values of the predictors of torsion in cases of pedunculated subserosal uterine leiomyoma. All of the statistical analyses were performed using the SPSS software program (ver. 20.0; IBM Co., Armonk, NY, USA). A *p* value of < 0.05 was considered to indicate statistical significance.

Results

A total of 28 women with pedunculated subserosal uterine leiomyoma who underwent laparoscopic myomectomy were included in this retrospective study. Torsion was observed in eight patients during surgery, the other 20 patients without torsion were classified into the nontorsion (control) group.

The demographics are summarized in Table 1. The patients in the torsion group were significantly older than those in the nontorsion group ($p = 0.032$). The rate of primigravida was significantly higher in the torsion group than in the nontorsion group ($p = 0.011$).

The comparison of the MRI findings is shown in Table 2. The average of length of the peduncle was significantly longer in the torsion group than in the nontorsion group ($p < 0.001$). There were no differences in the maximum diameter or the volume of the subserosal uterine leiomyoma and the thickness of the peduncle.

In ROC curve analysis, a length to thickness ratio (length thickness index) of > 10 mm showed 80% sensitivity, 100% specificity, 100% positive predictive value (PPV), 90% negative predictive value (NPV), and 92% accuracy with an AUC of 0.95 [95% confidence interval (CI) = 0.86–1.00] (Figure 3). The other components were determined as follows: a length of ≥ 10 mm showed 100% sensitivity, 70% specificity, 57% PPV, 100% NPV, and 78% accuracy with an AUC of 0.85 (95% CI = 0.71–0.99); and a length of ≥ 15 mm showed

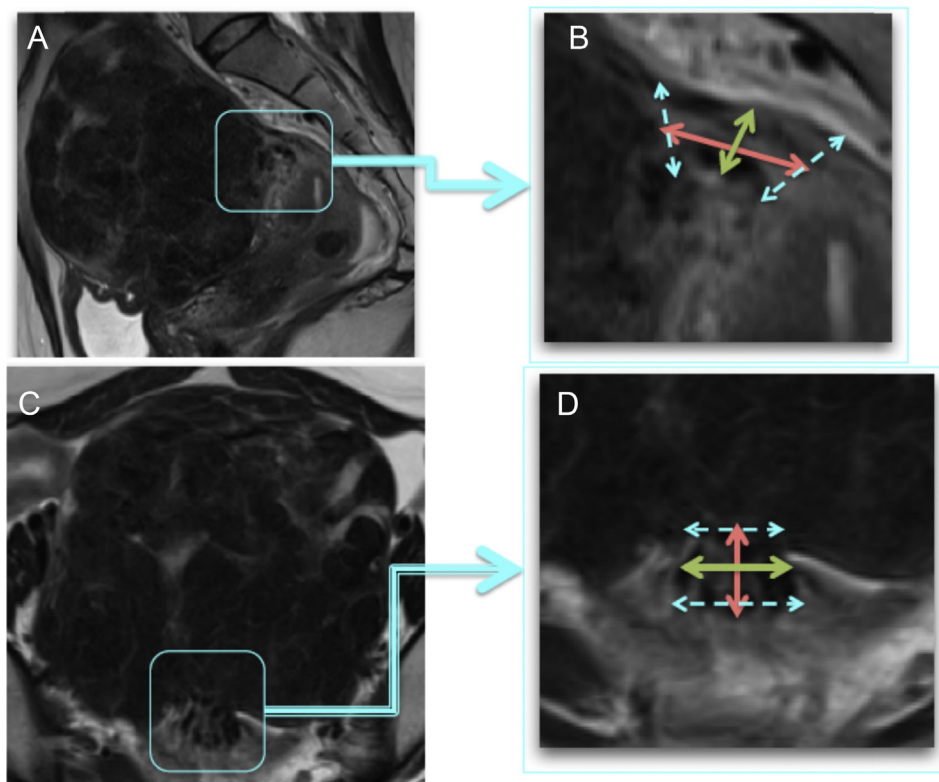


Figure 1. The measurement of the length and thickness of the peduncle (red, length; green, thickness). A; Sagittal section, B; Enlarged sagittal section, C; Axial section, D; Enlarged axial section.

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