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Risk factors and outcomes of conversion to laparotomy of total laparoscopic hysterectomy: A single center experience

Total laparoskopik histerektominin laparotomiye dönüşümünün risk faktörleri ve sonuçları: Tek merkezli bir deneyim

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ABSTRACT

Aim: This study aimed to analyze the risk factors and outcomes associated with conversion of total laparoscopic hysterectomy (TLH) to laparotomy in patients undergoing surgery for benign gynecologic conditions.

Materials and Methods: A retrospective analysis was conducted of 160 women aged 35 to 70 years who underwent TLH or a procedure that started laparoscopically but required conversion to laparotomy between May 2016 and August 2021. Patients with suspected malignancy, previous oncologic procedures or incomplete data were excluded. Data collected included demographics, surgical indications, surgeon experience, intraoperative complications, and outcomes such as hospitalization, blood transfusion requirements, and intensive care unit (ICU) admission. Statistical analyses were performed to identify significant risk factors for conversion.

Results: Of the 160 patients, 81 (50.6%) completed surgery laparoscopically, while 79 (49.4%) required conversion to laparotomy. The main reasons for conversion were adhesions (41.8%) and a large uterus (27.8%). Conversion cases had significantly longer hospital stays ($p = 0.012$), a higher rate of blood transfusion ($p = 0.006$) and a higher need for ICU admission ($p = 0.011$). Surgeon experience was not a statistically significant factor for conversion rates ($p = 0.198$), although experienced surgeons encountered more cases with the large uterus.

Conclusion: Conversion from TLH to laparotomy is associated with increased morbidity, including longer hospital stays and higher transfusion rates. Adhesions and large uterine size were identified as major risk factors. Preoperative assessment and careful planning may reduce the need for conversion and improve patient outcomes.

Keywords: Laparoscopy, laparotomy, hysterectomy, surgical complications, risk factors

ÖZ

Amaç: *Bu çalışmanın amacı, iyi huylu jinekolojik hastalıklar nedeniyle total laparoskopik histerektomi (TLH) uygulanan hastalarda laparotomiye dönüşüm ile ilişkili risk faktörlerini ve sonuçları analiz etmektir.*

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Gereç ve Yöntem: *Mayıs 2016 ile Ağustos 2021 tarihleri arasında TLH veya laparoskopik olarak başlatılıp laparotomiye dönüştürülen ameliyat geçiren, yaşları 35 ile 70 arasında değişen 160 kadının retrospektif analizi yapıldı. Şüpheli malignitesi olanlar, önceki onkolojik operasyon geçirenler ve eksik verisi olan hastalar çalışma dışı bırakıldı. Toplanan veriler arasında demografik bilgiler, cerrahi endikasyonlar, cerrah deneyimi, intraoperatif komplikasyonlar ve hastanede yatış süresi, kan transfüzyonu gereksinimi, yoğun bakım ünitesine (YBÜ) kabul gibi sonuçlar yer aldı. Dönüşüm için anlamlı risk faktörlerini belirlemek amacıyla istatistiksel analizler yapıldı.*

Bulgular: *160 hastanın 81'i (%50,6) ameliyatı laparoskopik olarak tamamladı, 79'u (%49,4) ise laparotomiye dönüştürüldü. Dönüşümün başlıca nedenleri adezyonlar (%41,8) ve büyük uterus varlığı (%27,8) idi. Dönüşüm yapılan olgularda hastanede kalış süresi anlamlı derecede daha uzun (p = 0,012), kan transfüzyon oranı (p = 0,006) ve YBÜ'ye kabul oranı (p = 0,011) daha yüksekti. Cerrah deneyimi dönüşüm oranları üzerinde istatistiksel olarak anlamlı bir etki göstermedi (p = 0,198); ancak deneyimli cerrahlar daha çok büyük uteruslu olgularla karşılaştı.*

Sonuç: *TLH'den laparotomiye dönüşüm, daha uzun hastanede yatış süresi ve daha yüksek transfüzyon ihtiyacı gibi artmış morbidite ile ilişkilidir. Adezyonlar ve büyük uterus boyutu, başlıca risk faktörleri olarak saptanmıştır. Preoperatif değerlendirme ve dikkatli planlama, dönüşüm ihtiyacını azaltarak hasta sonuçlarını iyileştirebilir.*

Anahtar Sözcükler: *Laparoskopi, laparotomi, histerektomi, cerrahi komplikasyonlar, risk faktörleri*

INTRODUCTION

Hysterectomy is one of the most frequently performed gynecological operations. The procedure can be performed by abdominal, vaginal, laparoscopic or robotic methods for a variety of indications, including abnormal uterine bleeding, uterine fibroids, adenomyosis or adnexal mass (1). Abdominal hysterectomy is the most common surgical approach; however, vaginal hysterectomy is associated with superior outcomes in all patient groups where it is feasible and indicated. Furthermore, when vaginal hysterectomy is not a viable option or contraindicated, laparoscopic hysterectomy is the preferred surgical method. Total laparoscopic hysterectomy (TLH) has been shown to result in a shorter recovery time, reduced hospitalization, lower intraoperative bleeding and fewer infections. As a result, laparoscopic surgery has become the predominant method of hysterectomy worldwide over the last ten years. However, laparoscopy does pose some challenges, including the potential for urinary tract injury and longer surgical time (2). One of the major concerns in such cases is unplanned laparotomy, which may be due to technical difficulties, inexperience of the surgical team or complications during the procedure.

As the number of laparoscopic hysterectomies increases, so does the number of unplanned conversions to laparotomy (3,4). However, studies in literature are limited, particularly in patients who have undergone surgery for benign gynecologic reasons. Furthermore, understanding the reasons for this conversion could reduce patient morbidity and help physicians in preoperative planning. Therefore, the aim of this study was to analyze the cases of patients who underwent laparoscopic surgery for benign indications and subsequently underwent open hysterectomy intraoperatively for any reason and to evaluate the results.

MATERIALS AND METHODS

1. Study design and participants

This retrospective study was conducted between May 1, 2016, and August 30, 2021, in our gynecology clinic. The study cohort comprises 160 women aged between 35 and 70 years who underwent laparoscopic hysterectomy or who started laparoscopically and were converted to open surgery. All patients had a benign hysterectomy indication. The study protocol was approved by the hospital ethics committee (No.: 2011-KAEK-25 2021/06-13). A signed informed consent form was obtained from all participants.

The definition of TLH was that the uterus had to be completely removed laparoscopically and extracted through a vaginal incision. This circular vaginal incision had to be closed with laparoscopic sutures. Women with a body mass index (BMI) of less than 18 kg/m² or more than 40 kg/m² were excluded from the study. In addition, the following exclusion criteria applied: Suspected malignant pathology, patients with a history of gynecologic oncology, patients who had undergone laparotomy or vaginal hysterectomy for benign gynecologic indications, and patients for whom no or incomplete data were available. The study included 81 patients who underwent total laparoscopic hysterectomy (group 1) and 79 patients who initially underwent laparoscopic surgery but then converted to laparotomy (group 2).

2. Classification of the surgeon's experience

As our study was a retrospective study, it was not possible to have all operations performed by the same surgeon. Therefore, we grouped the surgeons according to the number of laparoscopies they had performed. The experience of the surgeons was classified as low, moderate, or high. Surgeons with low experience were categorized as surgeons who had performed an average of three laparoscopies per month, surgeons with moderate experience as surgeons who had performed four to ten laparoscopies per month, and surgeons with high experience as surgeons who had performed more than ten laparoscopies per month (5).

3.Data collection

The following data were collected: Age, gravidity, parity, body mass index, history of pelvic surgery and previous surgeries, results of smears and endometrial samples, indications for hysterectomy (such as uterine myoma, abnormal uterine bleeding, adenomyosis), presence of peroperative complications, and surgeons' experience. Data collected by the surgical team included reasons for laparotomy in the study group, need for a drain, pre- and postoperative laboratory values (Hg, Hct, WBC), length of hospital stay, requirement for blood transfusion and necessity for intensive care. These data were then compared between the groups.

History of pelvic laparotomy was recorded as surgical procedures with laparotomy regardless of indication, except for simple appendectomy, which was excluded because it is generally associated with minimal pelvic adhesions. Other pelvic bowel or bladder surgeries were included. Conversion from laparoscopy to laparotomy was defined as the need for a standard laparotomy due to complications or technical difficulties at any time during surgery. Intraoperative complications included injury to the ureter, bladder and bowel and conditions requiring additional treatment.

4. Surgical technique

The patient was placed under general anesthesia with endotracheal intubation in the lithotomy position with legs extended at 60°. A Foley catheter was placed to ensure that the bladder was emptied during the procedure. All patients received a preoperative intravenous prophylactic antibiotic consisting of 2 g cefazolin. Prior to TLH, all patients were required to undergo complete bowel preparation, including a diet of clear liquids, 12 hours before surgery. During the surgical procedure, patients were placed in the deep Trendelenburg position. The disposable uterine manipulator (RUMI Uterine Manipulator; Cooper Surgical) was inserted vaginally to mobilize the uterus and delineate the vaginal fornix. Carbon dioxide pneumoperitoneum was achieved with a Veres needle. Intraperitoneal pressure was maintained at 15 mmHg throughout the surgical procedure.

Four disposable laparoscopic ports were used. The ports were placed at the following locations: 10 mm subumbilical, 5 mm in the right and left lower quadrants, and 5 mm in the left paraumbilical region. The round ligaments were then sealed with LigaSure and cut. In cases where the ovaries were to be removed, the utero-ovarian ligaments or the infundibulopelvic ligaments were sealed and transected, depending on the surgical plan. Using mechanical ultrasound energy, an incision was made in the vesicouterine peritoneum at the level of the vaginal fornix. The bladder was separated from the lower uterine segment with the colpotomizer system, leaving the vaginal fornixes exposed. The uterine vessels were then carefully closed and divided at the level of the lateral fornix. The anterior colpotomy was performed by incising the vagina at the level of the fornix and continuing laterally and posteriorly, effectively releasing the uterus from its vaginal attachments. The vaginal vault was then closed laparoscopically. Abdominal hysterectomy was performed in accordance with the technique described for benign disease (6).

5.Outcomes

The primary outcome of the study is to investigate the underlying causes and risk factors associated with conversion from TLH to laparotomy. The secondary outcome is to evaluate the surgical outcomes of patients converted from TLH to laparotomy.

6. Statistical analysis

Statistical analysis was performed using the SPSS program (version 20, SPSS, Chicago, IL). Data was expressed as mean ± SD and percentages. Continuous variables were analyzed using visual (histograms, probability plots) and analytical methods (Kolmogrov-Simirnov / Shapiro-Wilk test) to determine whether they were normally distributed or not. If the numerical data were parametric, an independent T-test was performed; if they were non-parametric, a Mann-Whitney U test was performed. Categorical data was compared using the chi-square test. p<0.05 was accepted as statistically significant

RESULTS

A total of 600 patients underwent laparoscopic surgery during the study period. Of these, 229 were performed using the TLH technique. A total of 160 women who met the defined inclusion criteria were included in the study. Of the total number of patients, 81 (50.6%) underwent laparoscopic surgery, while 79 (49.4%) underwent conversion to laparotomy.

Table-1 shows the demographic and clinical characteristics of the patients. The laparoscopically completed cases had higher gravidity and parity. No significant difference was found between the groups in terms of previous pelvic laparotomy. While 44 (54.3%) of patients in group 1 had undergone surgery for adenomyosis, 24 (30.4%) of patients in group 2 had undergone surgery for uterine myoma (p < 0.001). The patients who returned for laparotomy had a statistically significant longer hospitalization time (p = 0.012).

Surgical procedures and complications are listed in Table-2. More experienced surgeons performed 38 (46.9) of the cases completed with laparoscopy and 47 (59.5%) of the cases that returned to laparotomy (p: 0.198). There was 1 (1.2) bowel injury in group 1, 2 (2.5) bladder injuries and 1 (1.3) bowel injuries in group 2 (p: 0.354). Drains were placed in 73 (90.1%) of laparoscopic and 48 (60.8%) of laparotomic patients, while 7 (8.9%) received blood transfusions (p-values <0.001 and 0.006, respectively). Of the patients who underwent laparotomy, 6 (7.6%) were admitted to the ICU (p: 0.011).

The primary indications for conversion to laparotomy were adhesiolysis in 33 (41.8%) patients and a large uterus in 22 (27.8%) patients (Table-3). Table-4 shows an evaluation of surgical experience and surgical approach. The data showed that surgeons with high surgical experience operated on 30 (35.3%) patients with uterine myoma, 21 (47.7%) patients with medium surgical experience, and 16 (51.6%) patients with low surgical experience with adenomyosis (p = 0.003). The surgeons with high surgical experience performed laparotomy for a large uterus in 18 patients (38.3%), while the surgeons with medium and low surgical experience performed laparotomy for adhesions in 8 patients (47.1%) and 11 patients (73.3%), respectively. Physicians with high surgical experience had a previous pelvic laparotomy in 55 patients (64.7%) of cases (p = 0.001).

Table-1. Demographic and clinical characteristics of patients

	Completed Laparoscopically Group 1 (n: 81)	Conversion to Laparotomy Group 2 (n: 79)	p-value
Age (years)	50 (34-87)	51 (23-84)	0.559
Gravidity	4 (1-12)	3 (0-12)	0.001
Parity	3 (1-11)	2 (0-7)	0.012
Previous pelvic laparotomy			
Yes	48 (59.3%)	35 (44.3%)	0.081
No	33 (40.7%)	44 (55.7%)	
Endometrial biopsy			
Normal	31 (38.3%)	37 (48.1%)	0.008
Endometrial Hyperplasia	10 (12.3%)	12 (15.6%)	
EIN	-	6 (7.8%)	
Endometrial Polyp	40 (49.4%)	22 (28.6%)	

Indications			
Myoma Uteri	14 (17.3%)	24 (30.4%)	<0.001
PMB	17 (21%)	16 (20.3%)	
Endometrial Hyperplasia	3 (3.7%)	8 (10.1%)	
Adnexal Mass	3 (3.7%)	14 (17.7%)	
AUB	44 (54.3%)	17 (21.5%)	
Hospitalization (days)	3 (2-9)	3 (2-25)	0.012

Data presented as median (range) or n (%), where appropriate.
P values were calculated using the Mann-Whitney U test for continuous variables and the Chi-square test for categorical variables.
Abbreviations: PMB; Postmenopausal Bleeding, AUB; Abnormal Uterine Bleeding, EIN ; Endometrial Intraepithelial Neoplasia.
Percentages may not total 100% due to rounding.

Table-2. Surgical techniques and intraoperative complications in laparoscopic and converted laparotomy procedures

	Completed Laparoscopically Group 1 (n: 81)	**Conversion to Laparotomy Group 2 (n: 79)**	**p-value**
Surgeon Experience			
Low	16 (19.8%)	15 (19%)	0.198
Moderate	27 (33.3%)	17 (21.5%)	
High	38 (46.9%)	47 (59.5%)	
Intraoperative Complications			
None	80 (98.8%)	76 (96.2%)	0.354
Bladder Injury	-	2 (2.5%)	
Bowel Injury	1 (1.2%)	1 (1.3%)	
Intraoperative Consultation			
None	80 (98.8%)	74 (93.7%)	0.201
Urology	-	2 (2.5%)	
General Surgery	1 (1.2%)	3 (3.8%)	
Drain Follow-up			
None	8 (9.9%)	31 (39.2%)	<0.001
Yes	73 (90.1%)	48 (60.8%)	
Blood Transfusion			
None	81 (100%)	72 (91.1%)	0.006
Yes	-	7 (8.9%)	
Postoperative Intensive Care Unit Admission			
None	81 (100%)	73 (92.4%)	0.011
Yes	-	6 (7.6%)	
Hemoglobin Change (g/dL)	1.4 (0.5-4.1)	1.1 (0.8-4.6)	0.077
Hematocrit Change (%)	4.7 (3.1-10)	3.8 (2.5-13.1)	0.055

Data presented as n (%) for categorical variables.
P values were calculated using the Chi-square or Fisher's exact test, as appropriate.
Peroperative consultations refer to additional intraoperative consultations requested from other surgical departments.
Hg and Hct changes represent the difference between preoperative and postoperative levels.

Table-3. Main causes for conversion to laparotomy

Variables	Patients
Adhesion	33 (41.8)
Laparoscopic surgery complication	3 (3.8)
Technical	11 (13.9)
Bleeding	8 (10.1)
Large uterus causing exposure difficulty	22 (27.8)
Urinary complication	2 (2.5)

The listed variables are the primary reasons leading to the decision for conversion from laparoscopic surgery to laparotomy.
Data presented as n (%).

Table-4. Indications and reasons for conversion to laparotomy depending on the surgeon's experience and the surgical approach

	Low	Moderate	High	p-value
Indications				**0.003**
Myoma uteri	1 (3.2)	7 (15.9)	**30 (35.3)**	
Postmenopausal bleeding	4 (12.9)	9 (20.5)	20 (23.5)	
Endometrial hyperplasia	3 (9.7)	3 (6.8)	5 (5.9)	
Adnexal mass	7 (22.6)	4 (9.1)	6 (7.1)	
Adenomyosis	**16 (51.6)**	**21 (47.7)**	24 (28.2)	
Indications for conversion to laparotomy				0.145
Adhesion	**11 (73.3)**	**8 (47.1)**	14 (29.8)	
Laparoscopic surgery complication	-	1 (5.9)	2 (4.3)	
Technical	2 (13.3)	4 (23.5)	5 (10.6)	
Bleeding	1 (6.7)	1 (5.9)	6 (12.8)	
Large uterus causing exposure difficulty	1 (6.7)	3 (17.6)	**18 (38.3)**	
Bladder injury	-	-	2 (4.3)	
Previous pelvic laparotomy				**0.001**
Yes	9 (29)	19 (43.2)	**55 (64.7)**	
No	22 (71)	25 (56.8)	30 (35.3)	

Data presented as n (%).
Surgical experience categorized as low, moderate, or high, based on the number of surgeries performed by the surgeon.
Indications and reasons for conversion to laparotomy are shown for each experience level.
P values were calculated using the Chi-square test.

DISCUSSION

The objective of this study was to investigate the reasons and risk factors for conversion of TLH to laparotomy. The rate of conversion to laparotomy was 49.4%. In this study, 54.3% of patients whose TLH procedure was planned and performed were found to have adenomyosis, with uterine myoma being the most common preoperative indication in patients who subsequently underwent laparotomy. In addition, the majority of conversions to laparotomy were attributed to adhesions (41.8%) and an enlarged uterus (27.8%) during the surgical procedure. Two of the conversions to laparotomy were performed to suture a bladder injury. Patients who underwent laparotomy were more likely to require a blood transfusion after surgery and to be treated in the intensive care unit. In particular, patients who had undergone TLH were more likely to require drain follow-up and had a greater reduction in hemoglobin and hematocrit.

Our results differ from the literature in terms of conversion rates and perioperative complication risks. While reported conversion rates for hysterectomy range from 0% to 19% (7), a higher conversion rate to laparotomy was found in our study. However, complication rates were lower: 1.2% in the group that underwent laparoscopy and 3.8% in the conversion group. In 2018, Uccella et al. reported a conversion rate of 4.4% for large uteri in 2018, but their study involved only two highly specialized surgeons (8). Numerous studies have shown that increased surgical volume reduces the likelihood of conversion (9,10). In contrast to previous studies, our data suggests that the conversion rate at our center is higher among experienced surgeons, likely due to their handling of more complex cases such as large uteri, fibroids, and previous pelvic surgery. This emphasis on resident training results in less experienced surgeons managing cases such as adenomyosis or postmenopausal bleeding. Furthermore, while surgical volume often reflects a surgeon's experience, decision making is subjective and cannot be readily captured in databases. Our study reflects real-world clinical scenarios by including a variety of indications and surgeons with different levels of experience in laparoscopy, representing the diversity of daily practice

The overall complication rate of 2.5% (1.2% completed TLHs, 3.8% conversion to laparotomy) observed in this study was lower than rates reported in previous studies, which ranged from 5.7% to 19.0% (11,12). These relatively low complication rates may be attributed to the fact that there was no hesitation in making the decision to perform laparotomy in appropriate cases. Despite the high conversion rate to laparotomy observed in our study, the low complication rates suggest that surgical procedures in our clinic are performed according to the principle of 'Primum non nocere', regardless of the surgeon's experience.

In this study, uterine myoma was the most common prior diagnosis in patients converting from TLH to laparotomy and was the indication for return to peroperative laparotomy in highly experienced surgeons. Nevertheless, a comprehensive ultrasound scan can determine the location, size and number of these fibroids prior to surgery. In the Leonard et al. 5-year TLH series of 416 patients, it was found that a uterus wider than 8 cm and a lateral diameter of fibroid in the uterus greater than 5 cm increased the likelihood of laparotomy, which was statistically significant (13). In contrast to the results of this study, several other studies in literature have reported that a uterine fibroid or a large uterus is not an indication for laparotomy. Nevertheless, the consensus from most studies is that experienced surgeons perform TLHs and that these indications cannot be the reason for conversion to laparotomy in the hands of experienced surgeons. Despite the lack of consensus in literature, it is recognized that large uteri or uterine fibroids may be difficult to adequately expose and access the uterine peduncles or arteries. It is therefore recommended to perform a detailed preoperative examination and correctly determine the positioning of the optic and lateral trocars before making the surgical decision for these patients. This approach has the potential to significantly reduce the likelihood of laparotomy.

As in previous studies by Twijnstra et al., adhesions were found to be an independent risk factor for conversion to laparotomy, particularly among less experienced surgeons (7,13,14). While severe adhesions can be anticipated preoperatively, their precise nature is usually only confirmed during laparoscopy. It is essential to inform patients with a history of surgery about the increased risk of conversion, and surgeons should not hesitate to perform a laparotomy if significant adhesions are encountered. Conversion should not be seen as a failure but as a necessary step to avoid serious complications. In this study, patients with additional drains after laparoscopy had greater hemoglobin and hematocrit changes compared to those who underwent laparotomy. Although laparoscopy has many advantages, including less blood loss and shorter hospital stays, our findings suggest that the decision to convert to laparotomy is often made to prevent complications, not due to inexperience, as indicated by the low rates of laparoscopy-related complications (3.8%) and bleeding (10.1%).

Studies have shown that intra-abdominal adhesions occur in 30-90% of patients after laparotomy, and adhesions or a history of laparotomy significantly increase the risk of conversion during gynecologic laparoscopy (4,15-17). Wang et al. also found higher conversion rates with an increased number of cesarean sections (18). Although no direct correlation between a history of abdominal surgery and laparotomy was found in this study, the TLH group had a higher prevalence of previous surgery. The subgroup analysis by Park et al. also showed a higher conversion rate with more previous surgeries [14]. Thus, TLH can be safely performed in patients with a history of pelvic surgery, but special care should be taken if the number of previous surgeries is high or the uterus is large. In such cases, experienced surgeons can help to improve case selection and minimize unnecessary conversions.

It should be noted that the present study is subject to certain limitations, including its retrospective design and the arbitrary distinction between the three groups of surgeons based on their laparoscopic experience. The establishment of numbers and cut-offs may lead to questions regarding the differences and allocation to the different groups. However, we hypothesize that performing at least 10 TLHs per month indicates a highly experienced group of surgeons who are used to dealing with the potential difficulties and challenges associated with this surgical procedure. In addition, we hypothesize that the introduction of new surgical devices, anti-adhesive agents, operating room environments, and varying levels of experience among assistants.

CONCLUSION

In conclusion, further research is required to ascertain the minimum number of advanced laparoscopic procedures. It is of great importance to identify potential risk factors for transition to laparotomy in patients undergoing TLH, as this allows for the implementation of appropriate measures to minimize the likelihood of such an occurrence. The principal risk factors are intraoperative pelvic adhesions and myoma uteri. The identification of these risk factors through a pre-operative work-up will enable surgeons to minimize the conversion rate and consider alternative hysterectomy routes. The choice of surgical hysterectomy route should be made only after a careful comparison of the risks and benefits involved. Cases suitable for TLH can be successfully completed with the technique in the hands of experienced surgeons. Further prospective studies, such as the scoring system of risk factors for transition to laparotomy, will be needed to confirm our results.

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Statements & Declarations

Competing Interests

The authors have no relevant financial or non-financial interests to disclose.

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Availability of data and material

The data underlying this article will be shared on reasonable request to the corresponding author.

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