

**A COMPARISON OF THE USE OF LIGASURE AND HARMONIC DEVICES IN  
PLACENTA PERCRETA HYSTERECTOMIES: A RETROSPECTIVE COHORT STUDY**Zeyneb Bakacak MD<sup>1</sup>, Murat Bakacak MD<sup>2\*</sup>, Kadir Güzin MD<sup>2</sup> and Aytekin Uzkar MD<sup>2</sup><sup>1</sup>Private Practice, Kahramanmaraş, Turkey.<sup>2</sup>Department of Obstetrics and Gynecology, Kahramanmaraş Sütçü İmam University, School of Medicine, Kahramanmaraş, Turkey.**\*Corresponding Author: Murat Bakacak MD**

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**ABSTRACT**

**Aim:** Caesarean hysterectomies performed in placenta percreta cases are procedures that can cause intense bleeding. New-generation vascular sealing systems are systems which can cut and seal at the same time, for which the field of use has expanded in recent years. The aim of this study was to make a retrospective study of hysterectomies performed using LigaSure (LS) and ultrasonic Harmonic (HS) devices. **Material and Method:** Placenta percreta cases with elective caesarean hysterectomy performed by the same surgeon were retrospectively screened. The cases were separated as the Harmonic group (Group 1) where HS devices were used in hysterectomies, and the LigaSure group (Group 2) where the LS device was used. The cases were compared in respect of demographic characteristics, operating time, number of transfused blood product units during the operation and in total, and the total amount of fluid in the abdominal drain. **Results:** Demographic data were similar in both groups. The operating time was found to be significantly shorter in the LS group ( $p < 0.001$ ). The number of intraoperative transfused erythrocyte suspension units (ES), the total number of transfused ES, and the total units of transfused fresh frozen plasma (FFP) were found to be statistically significantly higher in the HS group than in the LS group ( $p:0.031$ ,  $p:0.022$ ,  $p:0.024$ , respectively). **Conclusion:** When compared with LS devices in caesarean hysterectomies applied to placenta percreta cases, HS was determined to be a system providing less successful hemostasis and leading to greater bleeding. Therefore, this system was not seen to be appropriate for use in this type of surgery.

**KEYWORDS:** Placenta percreta; caesarean hysterectomy; ligasure; harmonic scalpel.**INTRODUCTION**

Placenta insertion anomalies are characterised by invasion of the placenta at different levels to the myometrium and serosa, and sometimes reaching adjacent organs. Although cases in this group of diseases are classified according to the depth of invasion, from low to high, as placenta accreta, increta and percreta, they can be grouped together as placenta accreta or placenta accreta spectrum (PAS).<sup>[1]</sup>

Placenta percreta is the least frequently seen subtype of PAS cases, but is the type in which most complications, morbidity and mortality are seen.<sup>[2]</sup> Attempting to remove the attached placenta by hand in these cases leads to intense bleeding and various outcomes, even death.<sup>[3]</sup> Therefore, the standard treatment in these cases is to perform caesarean hysterectomy under elective conditions, leaving the placenta in place.<sup>[4]</sup> In these hysterectomies, one of the most critical stages is the dissection of the bladder peritoneum and devascularisation of vascular anastomoses between the

placenta and the bladder. Heavy bleeding can be observed at this stage.<sup>[5]</sup>

The use of new hemostatic energy-based devices has started in recent years to shorten operating times in both laparoscopic and open surgery operations and to provide effective hemostasis. One of these is the Harmonic scalpel (HS), which is used with ultrasonic vibration at 55 Hz. In this way, proteins are denatured by transferring the mechanical energy to tissue proteins and breaking down the hydrogen links in these proteins. This denaturation provides sealing of vessels up to 5mm in diameter.<sup>[6]</sup> The LigaSure vascular sealing system (LS) is a bipolar hemostasis method which denatures collagen and elastin in the connecting tissues of the vessels and around the vessels. By these tissues then combining, sealing is provided in vessels up to 7mm.<sup>[7]</sup>

The aim of this retrospective study was to compare placenta percreta cases applied with caesarean hysterectomy using HS and LS devices in respect of

operating time, intraoperative bleeding, and blood product transfusions made.

## MATERIALS AND METHODS

Approval for the study was granted by the Clinical Research Ethics Committee of Kahramanmaraş Sütçü Imam University. A retrospective examination was made of 29 cases of caesarean hysterectomy, who had been diagnosed preoperatively between January 2016 and December 2019 with placenta percreta, had the diagnosis confirmed on postoperative histopathological examination and were operated on by the same surgeon. The cases comprised 12 where HS was used and 17 where LS was used. Data were collected from the hospital records, including age, gravida, parity, gestational age, infant birthweight, maternal body mass index (BMI), and number of previous caesarean deliveries. From the archived patient records and hospital automated records system, data were recorded of operating time, number of erythrocyte suspension (ES) units transfused intraoperatively, total ES transfusions, total units of fresh frozen plasma (FFP) transfused, and the amount of fluid in the abdominal drain postoperatively.

All the operations were under elective conditions. No organ-sparing surgery was attempted in any case. In all the cases, the abdominal incision was vertical on the midline. Making a uterine incision from a point far from the placenta, the fetus was delivered, then leaving the placenta in place, a hysterectomy was performed. In all cases, the uterine ligaments and vessels were ligated and cut, and new generation bipolar and ultrasonic energy manual devices were used in the dissection of the uterus anterior surface from the bladder and in the occlusions of vascular anastomoses between the placenta and the bladder.

When bleeding developed, conventional techniques were used. In this period it was not possible in our clinic to have a choice of selecting and using HS or LS systems. Whichever was available at the time was used. The cases were separated into two groups as the Harmonic group (Group 1) where HS was used (Ethicon CS14C Ultracision Harmonic Scalpel 5mm Curved Shears, Ethicon Endo-Surgery, Cincinnati, OH, USA) and the

LigaSure group (Group 2) where LS was used (Covidien LF4318 LigaSure Impact Open Instrument 18 CM and Covidien LF1212A Ligasure Sealer/Divider Small Curved Jaw 6/Ca (Medtronic [formerly Covidien], Minneapolis, MN, USA).

In the cases applied with total hysterectomy, the vagina proximal section, and in those applied with subtotal hysterectomy, the remaining distal section of the uterus, were closed with separate No 1 polyglactine sutures. A No 16 Foley catheter was placed in the abdomen as a drain in all cases. The cases were compared in respect of demographic characteristics, operating time, number of units of blood products transfused during the operation and in total, and the amount of fluid in the abdominal drain.

## Statistical Analysis

Data obtained in the study were analysed statistically using SPSS 17.0 software (IBM Corporation, Armonk, NY, USA). Conformity of the data to normal distribution was assessed with the Shapiro-Wilk test, and homogeneity of variance with the Levene test. In the comparisons of two independent groups of data, the Independent Samples t-test was used and the Mann Whitney U-test with Exact results. Quantitative data were stated in the tables as mean±standard deviation (SD), median and interquartile range (IQR), and median and range (minimum-maximum) values. Categorical data were stated as number (n) and percentage (%). A value of  $p < 0.05$  was accepted as statistically significant.

## RESULTS

When the two groups were compared in respect of demographic data, no statistically significant difference was determined in respect of age, gravida, parity, gestational age, birthweight, BMI, and previous number of caesareans ( $p=0.187$ ) (Table 1). The operating time was found to be significantly shorter in the LS group ( $p < 0.001$ ). The number of intraoperative transfused ES units, the total number of transfused ES, and the total units of transfused FFP were found to be statistically significantly higher in the HS group than in the LS group ( $p:0.031$ ,  $p:0.022$ ,  $p:0.024$ , respectively). The amount of fluid in the abdominal drain postoperatively was similar in both groups ( $p=0.063$ ) (Table 2).

**Table 1: Comparisons of the demographic parameters of the groups.**

	Harmonic group (n:12)	LigaSure group (n:17)	P value
Age (years)	33.73±3.56	34.30±3.91	0.187
Gravida	4.30±1.41	4.11±1.45	0.311
Parity	3.20±1.15	2.97±1.15	0.219
Gestational age (weeks)	34.73±4.31	34.51±3.13	0.676
Infant birthweight (gr)	2681.00±648.09	2654.65±447.81	0.674
Maternal BMI (kg/m <sup>2</sup> )	29.00±4.24	29.83±3.06	0.667
Previous number of caesarean deliveries	2.10±0.77	2.44±1.17	0.144

Data are expressed as mean ±SD, unless otherwise noted. *Independent T Test (Bootstrap)- Mann Whitney U Test (Monte Carlo)*

BMI: Body Mass Index

**Table 2: Comparison of the intraoperative findings of the cases.**

	Harmonic group (n:12)	LigaSure group (n:17)	P value
Operation time (mins)	119.83±15.16	82.86±14.13	0.001
Number of erythrocyte suspension units transfused intraoperatively	2.62±1.79	1.82±1.36	0.031
Total number of erythrocyte suspension units transfused	3.81±2.45	3.26±1.55	0.022
Total number of fresh frozen plasma units transfused	2.30±1.83	1.56±1.03	0.024
Total amount of fluid in the abdominal drain (cl)	653.75±643.06	531.28±179.19	0.063

Data are expressed as the mean ±SD, unless otherwise noted. *Independent T Test(Bootstrap) - Mann Whitney U Test(Monte Carlo)*

## DISCUSSION

In this study, the effects on bleeding and operating times of the use of the new-generation LS bipolar system and the HS device that operates on the principle of ultrasonic energy were compared in elective caesarean hysterectomies performed because of placenta percreta. The results showed that the operating time was shorter and the requirement for blood products transfusion was less in the LS group, and there was less fluid postoperatively in the abdominal drain. These results suggested that the HS device was less successful in providing hemostasis in these cases. It was thought that this could be because the diameter of the vascular structures in the uterine serosa and between the uterus and bladder was >5mm in these types of cases and HS cannot provide sufficient hemostasis in vessels of this size. It was also thought that as the ends of the HS device are sharper than those of the LS, especially when holding the vascular structure to be occluded and at the stage of separation by dissection of the bladder, which has greater vascularity, from the anterior surface of the uterus, this could lead to more bleeding.

To the best of our knowledge, there are no prospective, comparative studies related to the methods for reducing bleeding in placenta percreta hysterectomies. The reason for this may be that the method to be used when bleeding occurs during these operations, which have a high possibility of heavy bleeding because of the nature of the disease, can change dynamically according to the experience of the surgeon and the hospital-medical equipment facilities. Therefore, these types of studies in literature are retrospective, as in the study of 44 cases by Ono et al investigating the efficacy of preoperative vascular occlusions,<sup>[8]</sup> or limited case series, as in the study of 3 cases by Polat,<sup>[9]</sup> which showed the efficacy of temporary occlusion with Bulldog vascular clamps of the internal iliac arteries before hysterectomy.

Just as there are no studies in literature comparing the efficacy of LS and HS in placenta percreta cases, there are also no studies of open gynaecological operations. These comparisons can be found in studies of

thyroid,<sup>[10,11]</sup> obesity,<sup>[12]</sup> and hemorrhoid<sup>[13]</sup> surgery. Velotti et al reported a retrospective evaluation of 225 LS and 197 HS sleeve gastrectomy cases. When comparing the efficacy on bleeding of the two systems, bleeding was observed over the omentum and in the stomach stapler line, and it was necessary to use hemoclips and soluble hemostatic material. Consequently, no significant difference was observed between the groups.

In a 2017 meta-analysis by Lou et al which analysed 47 randomised, controlled studies, the efficacy of hemostatic devices was investigated in thyroid surgery. In both the LS and HS methods there was determined to be a shorter operation time and less bleeding compared to conventional surgeries. No difference was determined between the HS and LS groups in respect of the complications of parathyroid gland damage and laryngeal nerve damage associated with lateral thermal damage, and the shortest operating times were determined in the HS groups.<sup>[11]</sup> In a multicentre, prospective, randomised study by Peker et al, modern vessel sealing systems were compared with conventional methods in 69 hemorrhoid patients. Although operating times were shorter and the amount of bleeding was less in the modern vessel sealing systems, it was reported that these patients experienced more postoperative pain, probably associated with thermal damage.

There were some limitations to this study, primarily the retrospective design. However, there are no prospective randomised studies in literature on the subject of methods to reduce bleeding or hysterectomy corresponding to organ-sparing surgery related to placenta percreta hysterectomies. Such a study design would not be ethical because of the nature of the disease. Other limitations were the low number of cases and the lack of a conventional surgical group where modern vessel sealing systems were not used. In addition, as the amount of bleeding was not measured with a direct method, postoperative early and late findings and complications were not evaluated. However, despite these drawbacks, this the first study in literature to have

compared modern vessel sealing systems in placenta percreta hysterectomies, and as the first study of the use of HS in these cases, the findings can be considered of value.

In conclusion, when compared with LS used in placenta percreta cases applied with caesarean hysterectomy, HS was seen to be less successful in providing hemostasis, thereby leading to more bleeding and as such was not considered to be a suitable system for use in this type of surgery.

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