Songkla Uterine Manipulator

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Abstract

The Songkla Uterine Manipulator (SUM) was developed for laparoscopic procedures. Its shaft consists of two stainless steel rods, which pivot a head and locking system. The obturator has a plate and is connected to the pivot head with a screw. The obturator has a diameter of 4.7 mm with three standard lengths of 6, 8, and 10 cm and there is a spring hook to retain it with the tenaculum. The SUM allows antevertion of the uterus up to 95 degrees and lateral motion of about 45 degrees bilaterally. From December 1996 to December 1999, the SUM was used successfully in 150 laparoscopic procedures, including 51 tubal sterilizations, 42 cases of adnexal surgery, 12 total laparoscopic hysterectomies and 45 laparoscopic assisted vaginal hysterectomies. The visualization of pelvic organs including both adnexae was good in all cases without trauma to the vagina, cervix or uterus.

Conclusion: The simplified low cost uterine manipulator was developed. Early results were good but more modifications are needed, such as mechanism to retain it to the cervix without the tenaculum and sealing of gas leakage from the vagina during laparoscopic hysterectomy.

Key word : Uterine Manipulator, Uterine Elevator, Laparoscopic Surgery

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The uterine manipulator is essential during gynecologic laparoscopy. It can be used to facilitate visualization of pelvic organs either for diagnosis or surgery. Usually, the Hulka controlling tenaculum[1], the Ramathibodi uterine manipulator[2] or blunt curette has been used[3]. However, these instruments cannot mobilize the uterus without changing their shaft axis. The degree of uterine

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mobilization is limited by the vaginal orifice or operating table if the patient's buttocks are too high. Valtchav KL developed a concept for fuller mobilization of the uterus about its natural axis of movement, the internal os[4]. Uterine manipulators commercially available today that were developed after Valtchav were designed mainly for infertile laparoscopic procedures, incorporated with a dye injection obturator and a hook to secure a tenaculum attached to the anterior lip of the cervix. These are expensive and heavy for general gynecological procedures, such as laparoscopic tubal sterilization, adnexal surgery or hysterectomy. A simple, inexpensive and durable uterine manipulator with a pivoting head is needed for basic gynecologic laparoscopy.

Design

The Songkla Uterine Manipulator (SUM) was made from 304 (18-8) stainless steel. The SUM's shaft consists of two rods, which pivot a head and locking system. The 4.7 mm intrauterine obturator has a 20-mm plate and is connected to the pivot head with a screw. The obturator's plate prevents trauma to the cervix and loss of the obturator in the uterine cavity. The pivot joint is made from screws and locked with nuts connected to two metal rods. There is a spring hook to retain the SUM with the standard tenaculum. The handle is a ring shape that can be held with the ring finger, and the pivot action can be manipulated by the thumb. The obturator can be locked at any angle with the locking screw. The SUM is 38 cm long without the obturator and weighs 140 g compared to the 36 cm length and 225 g weight of the commercial Valtchav uterine manipulator. The SUM set is made up of three standard obturators with lengths of 6, 8 and 10 cm and costs 125 US$ (Fig. 1). The diagram showing parts of the SUM is shown in Fig. 2. The 4-cm diameter vaginal delineator ring for laparoscopic hysterectomy is an option.

MATERIAL TESTING

The component of 304(18-8) stainless steel from a local hardware store was tested using electron probe microanalysis technique (EPMA) and compared to the stainless steel used in medical instruments from Germany, U.S.A, and Australia. EPMA results are shown in Table 1 as mean ± standard deviation. The stainless steel used contained 19.65± 0.05 per cent Chromium, and 9.28±0.10 per cent Nickel comparable to the imported medical instruments.

Technique

After the patient has been anesthetized and prepared in the lithotomy position, a vaginal examination is performed to establish the size, position and mobility of the uterus. The appropriate obturator length is selected and connected to the pivot head. The vaginal speculum is inserted, the anterior

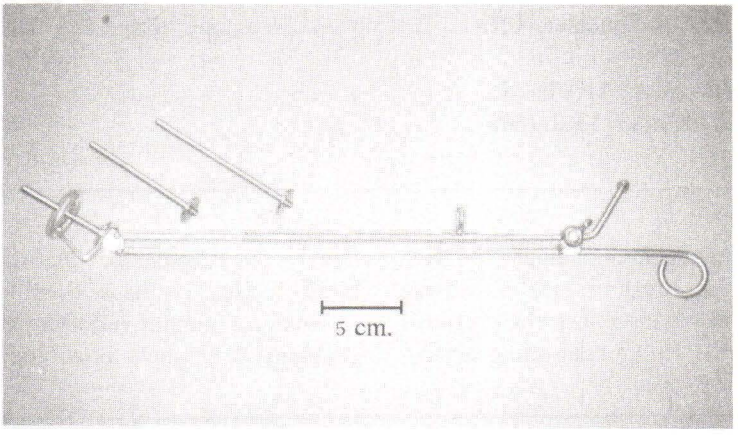

Fig. 1. The Songkla Uterine Manipulator with its 3 standard varying length obturators. The 6-cm obturator and optional 4-cm vaginal delineator ring connected.

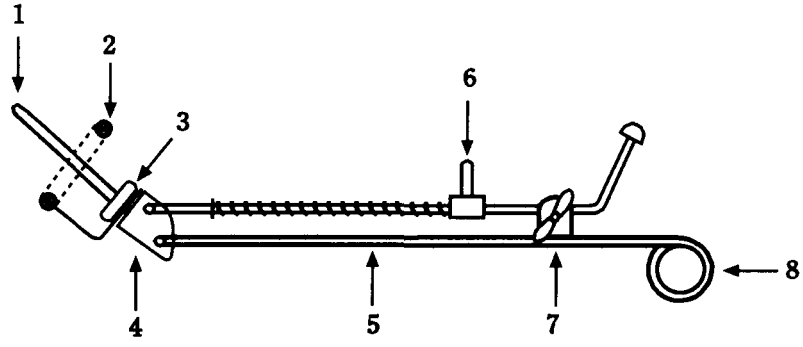

Fig. 2. Diagram showing parts of the Songkla Uterine Manipulator: Intrauterine Obturator (1), Vaginal Delineator Ring (2), Obturator's Plate (3), Pivot Head (4), Shaft (5), Spring Hook (6), Locking Nut (7) and Handle (8).

Table 1. Component of stainless steel of medical instruments from various sources (values are expressed as mean ± standard deviation).

Sources	Components (%)		
	Chromium	Nickel	Ferrous
USA	19.29±0.06	8.76±0.24	71.95±0.24
Australia	18.99±0.21	9.55±0.25	71.46±0.66
Germany	12.53±0.10	0.15±0.13	87.31±0.20*
Local	19.65±0.05	9.28±0.10	71.07±0.13

*Ferritic stainless steel, ferromagnetic.

lip of the cervix is held with the tenaculum and the SUM is inserted carefully into the uterine cavity along its axis until the obturator's plate has reached the ectocervix. The SUM is hooked with the tenaculum using the spring hook, the uterus is manipulated and the SUM is then locked into position by tightening the locking screw. When the laparoscopic hysterectomy is planed, the vaginal delineator ring is connected to the SUM using the obturator's screw before insertion into the vagina.

RESULTS

The SUM was used successfully in 150 cases of laparoscopic procedure (Table 2). The results of the surgery fall outside the purpose of this investigation. The mean time of tubal sterilization was 18 min (range, 10-25), salpingectomy was 60 min (range, 50-70), oophorectomy was 75 min (range, 50-115), salpingo-oophorectomy was 93 min (range, 65-125), ovarian cystectomy was 96 min (range, 65-135), total laparoscopic hysterectomy (TLH) was 176 min (range, 130-215), and laparoscopic assisted vaginal hysterectomy was 117 min

Table 2. Laparoscopic procedures using the Songkla Uterine Manipulator.

Procedures	Number
Sterilization (silastic band)	51
Ovarian cystectomy	17
Oophorectomy	6
Salpingectomy	4
Salpingo-oophorectomy	15
Gasless total laparoscopic hysterectomy	12
Laparoscopic assisted vaginal hysterectomy	45
Total	150

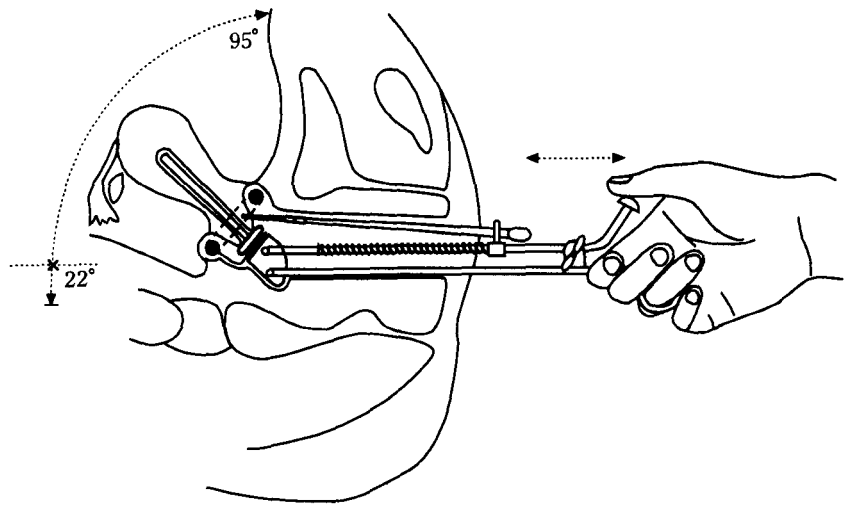

Fig. 3. The action of the Songkla Uterine Manipulator.

(range, 55-195). TLH was performed by gasless technique using the simplified abdominal wall-lifting device[5]. The SUM allows the surgeon to antevert the uterus up to 95 degrees and retrovert up to 22 degrees (Fig. 3). The visualization of pelvic organs, including adnexae, was good in all cases without trauma to the vagina, cervix or uterus. Insertion was easy in all cases, but three cases of nulliparous patients needed cervical dilatation. In no cases of this investigation did the SUM slip out of the uterus. No perforations or infections occurred. Prophylactic antibiotics were given in all hysterectomy cases.

The comparative study of the SUM *versus* the Hulka controlling tenaculum and sponge gauze to manipulate the uterus was conducted in 12 cases of total laparoscopic hysterectomy. The Hulka controlling tenaculum could antevert the uterus more than 45 degrees in 66.7 per cent (8/12) of cases, while only 33.3 per cent (4/12) of cases for the sponge gauze compared to 100 per cent when using the SUM. The sponge gauze can push the uterus upward, but only minimal rotation of the uterus may be achieved while the Hulka controlling tenaculum can rotate the uterus less than 45 degrees. By contrast, the SUM can rotate approximately 45 degrees bilaterally and also push the uterus upward.

DISCUSSION

The Hulka controlling tenaculum is used most commonly in Thailand. It has no cervical plate, and when force is applied to push the uterus upward, the sound tip can slide into the uterine cavity and may perforate the uterine fundus, and may also traumatize the cervix by the tooth of its tenaculum. The Ramathibodi uterine manipulator has a small (3-mm), fixed length (5-cm) obturator and the tip is flat, so it can perforate the uterus easily during introduction. When the uterus is large, the 5-cm obturator is too short to make full antevertion of the uterus. The operating table limits antevertion of the uterus using either the Hulka controlling tenaculum or the Ramathibodi's when the patient's buttocks are not low enough. The imported uterine manipulators that have a pivoting head, can perform dye instillation, and have a hook to retain it with the tenaculum are expensive at a cost of 1300 US$. The SUM is a simplified uterine manipulator that makes use of the pivot principle and is designed mainly for general gynecological purposes. It has a plate to prevent displacement of the obturator tip to avoid fundal perforation and the appropriate obturator length can be selected. Because the normal uterine cavity is approximately 7 cm, the 6-cm obturator was designed. The selected obtu-

rator length should be 1-2 cm shorter than the uterine cavity to minimize risk of uterine perforation when substantial force is applied to the cervix. The diameter of the obturator of the SUM was larger than Ramathibodi's to reduce risk of perforation or false tract. If the cervical canal is small and the 4.7-mm obturator cannot be inserted without difficulty, the cervical canal must be dilated with 5-mm Hegar's dilators. The SUM can antevert the uterus up to 95 degrees and induce lateral rotation up to 45 degrees bilaterally. When the sponge gauze is pushed in the posterior fornix, it can antevert the uterus in only 33.3 per cent of cases because the lower uterine segment is soft. This finding suggested that the sponge gauze was not an effective uterine mobilizer, not consistent with the previous study(6). The vaginal delineator ring is very useful to identify the vaginal fornix during laparoscopic hysterectomy. It prevents over or under dissection of the bladder and delineates the cutting line of the vagina. The SUM can be used to assist general gynecological laparoscopic surgery. Further modifications are needed to prevent gas leakage from the vagina during conventional laparoscopic hysterectomy and mechanism to retain it to the cervix without the tenaculum.

SUMMARY

A simplified, low cost uterine manipulator has been developed. It is a good alternative to the existing uterine manipulators for gynecological laparoscopy.

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REFERENCES

1. Hulka JF. Controlling tenaculum : Instrument for uterine mobilization during tubal sterilization. Am J Obstet Gynecol 1972; 112: 865-6.
2. Osathanondh V. Suprapubic mini-laparotomy, uterine elevation technique : simple, inexpensive and out-patient procedure for interval female sterilization. Contraception 1974; 10: 251-62.
3. Hulka JF, Reich H. Textbook of laparoscopy, 2nd ed., Philadelphia: W.B. Saunders, 1994: 177.
4. Valtchev KL, Papsin FR. A new uterine mobilizer for laparoscopy : Its use in 518 patients. Am J Obstet Gynecol 1977; 127: 738-40.
5. Tintara H, Leetanaporn R, Getpook C, Suntharasaj T. Simplified abdominal wall-lifting device for gasless laparoscopy. Int J Gynecol Obstet 1998; 51: 165-70.
6. Vivatpatanakul K, Kaewsuk O, Sinchai W, Niyomwan V, Dusitsin N. Interval female sterilization : standard minilap vs a new modified minilap technique. Thai J Obstet Gynaecol 1996; 8: 21-6.

เครื่องโยกมดลูกสงขลา

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เครื่องโยกมดลูกสงขลา เป็นเครื่องมือช่วยเคลื่อนไหวมดลูก สำหรับการผ่าตัดผ่านกล้องส่องช่องท้องทางนรีเวช ตัวเครื่องประกอบด้วยแกนสเตนเลส 2 ชิ้น ต่อกับหัวกระดกและมีระบบล็อคที่ด้ามจับ แกนสอดโพรงมดลูกมีแป้นปะทะต่อกับหัวกระดกด้วยเกลียว แกนสอดมีเส้นผ่าศูนย์กลาง 4.7 มม. มีความยาวมาตรฐาน 6, 8 และ 10 ซม.ให้เลือก มีตะขอสปริงสำหรับเกี่ยวตัวเครื่องกับเครื่องจับปากมดลูก (tenaculum) เครื่องโยกมดลูกสงขลาสามารถกระดกมดลูกมาทางด้านหน้าได้ 95 องศา และเอียงด้านข้างได้ประมาณ 45 องศา ได้ใช้เครื่องโยกมดลูกสงขลาในการผ่าตัดผ่านกล้องส่องช่องท้องในผู้ป่วย 150 ราย ระหว่างเดือนธันวาคม 2539 ถึง ธันวาคม 2542 เป็นการทำหมัน 51 ราย ผ่าตัดปีกมดลูก 42 ราย ตัดมดลูกผ่านกล้องส่องช่องท้อง 12 ราย และตัดมดลูกทางช่องคลอดโดยใช้กล้องส่องช่องท้องช่วย 45 ราย สามารถมองเห็นอวัยวะในอุ้งเชิงกรานได้ชัดเจนและทำผ่าตัดได้สำเร็จทุกราย ไม่มีอันตรายต่อปากมดลูก ช่องคลอด หรือตัวมดลูก

บทสรุป: เครื่องโยกมดลูกสงขลา สามารถใช้ช่วยผ่าตัดผ่านกล้องส่องช่องท้องได้ดี ราคาถูก แต่ยังต้องพัฒนาให้สามารถยึดติดกับปากมดลูกโดยไม่ต้องใช้ร่วมกับเครื่องจับปากมดลูก และมีระบบป้องกันก๊าซรั่วขณะตัดมดลูกผ่านกล้องส่องช่องท้อง

คำสำคัญ : เครื่องโยกมดลูก, เครื่องยกมดลูก, การผ่าตัดผ่านกล้องส่องช่องท้อง

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