



Figure 4a–c continued

Table 3 The B-Lynch surgical technique: clinical points

1. User-friendly suture material monocryl No.1 mounted on 90-cm curved ethigard blunt needle (codeW3709) (Ethicon, Somerville, NJ). Other rapidly absorbable sutures can be used according to the surgeon's preference. A good length and needle are essential<sup>19</sup>
2. Basic surgical competence required
3. Uterine cavity checked, explored and evacuated
4. Suture bends maintain even and adequate tension without uterine trauma or 'shouldering'
5. Allows free drainage of blood, debris and inflammatory material
6. Transverse compression suture applied to the lower segment for abnormal placentation effectively controls bleeding
7. Simple, effective and cost-saving
8. Fertility preserved and proven<sup>3</sup>
9. Mortality avoided<sup>3</sup>
10. World-wide application and successful reports (> 1300) (B-Lynch, personal data base, christopherbl@aol.com)
11. Potential for prophylactic application at Cesarean section when signs of imminent postpartum hemorrhage develop, e.g. placenta accreta, or where blood transfusion is declined, e.g. placenta previa surgery on a Jehovah's Witness

### WORLD-WIDE REPORTS

The current level of application of the B-Lynch suture world-wide includes over 1300 successful cases; of these, there are only 19 failures.

The Indian subcontinent has the largest number of reported successful applications, over 250, followed by Africa, South America, North America, Europe and other countries. The

**Table 4** The Hayman uterine compression suture: clinical points

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1. Lower uterine segment or uterine cavity not opened
  2. Uterine cavity not explored under direct vision
  3. Probably quicker to apply
  4. No feed-back data on fertility outcome
  5. Morbidity feed-back data limited
  6. Unequal tension leads to segmented ischemia secondary to slippage of suture – ‘shouldering’ with venous obstruction
- 

**Table 5** The Cho multiple square sutures: clinical points

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1. Multiple full-thickness square sutures applied, probably time-consuming if many square sutures required
  2. Uterine cavity drainage restriction – pyometra risk<sup>15</sup>
  3. No feed-back data on fertility outcome
  4. Morbidity feed-back data limited
  5. Rhythmic contraction not facilitated and involution impeded
  6. The production of multiple uterine senescentiae (see Chapter 24)
- 

17 reported failures were because of delay in application, poor technique, defibrination and inappropriate material. Various suture materials have been used. However, the monocril suture (code WC3709) is recommended because it is user- and tissue-friendly with uniform tension distribution and is easy to handle<sup>20</sup>. Holtsema and colleagues recently opined, in a review, that the B-Lynch technique for postpartum hemorrhage should be an option for every gynecologist<sup>21</sup>. Wohlmuth and colleagues published outcome of a large series with a 91% success rate (world-wide cumulative success rate 98%)<sup>22</sup>.

## CONCLUSION

Of the compression suturing techniques described above, the B-Lynch procedure has been recommended by the 2000–2002 Triennial Confidential Enquiry into Maternal Deaths in the United Kingdom<sup>23</sup>, The Royal College of

Obstetricians and Gynaecologists in the UK, and the Cochrane Database of systematic reviews. To date, no serious adverse outcomes have been associated with the B-Lynch surgical technique<sup>3,17,20,22,24</sup>. Furthermore, the latest 2000–2002 Triennial Confidential Enquiry states that no deaths were reported in women who had had interventional radiology or B-Lynch suture in the management of postpartum hemorrhage<sup>23</sup>.

It is important to remember that, if a patient is a known or appreciated risk for postpartum hemorrhage, then the elective delivery should be performed in the day time, with prearranged co-operation between the imaging department and the obstetric team. Theater staff should be alerted in time so that conservative surgery can be carried out quickly if needed. Patients at particular risk are those with obesity, cardiomyopathy, coagulopathy, abnormal placentation, polyhydramnios and specific religious convictions contraindicating blood transfusion.

## PLACEMENT OF LIGATURES IN STEPWISE DEVASCULARIZATION

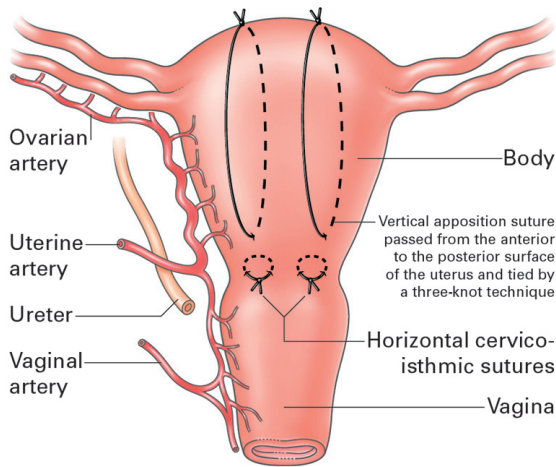
The essential requirements are not simple and may not be available in every unit. First, there is a need for a competent obstetrician who is conversant and competent at pelvic gynecological procedures, and who has a working knowledge of the pelvic anatomy, including the vascular and neurological supply of the pelvic organs. Second, there is a need for an obstetric anesthetist, as well as a vascular and/or gynecological cancer surgeon on standby. Finally, provisions must be available for admission postoperatively to the intensive care unit.

This set of requirements takes full account of the extraordinarily generous blood supply to the uterus and the pelvic organs (see Figure 7). The surgical approach starts with ligation of the uterine artery and its distribution to the uterus, preferably as it emerges from crossing over the ureter or as it approaches the uterine wall to penetrate and establish its division<sup>25</sup>. This could be carried out unilaterally or bilaterally about 2 cm from the uterine angle at Cesarean section or where the lower segment is opened after conservative surgery for postpartum hemorrhage has failed (Figure 8).

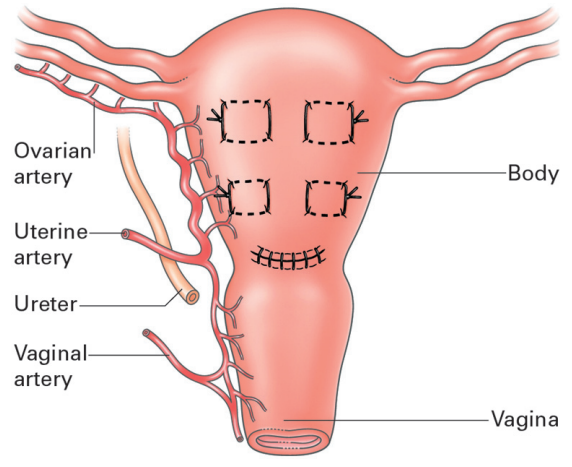
POSTPARTUM HEMORRHAGE

It is absolutely essential to remember that the internal iliac (hypogastric artery) gives off independent branches that descend to the cervix and vagina (vaginal branch), respectively (see Chapter 32). Devascularization can be

achieved by independent ligation sutures applied bilaterally to the cervix and/or vagina. The ovarian vascular supply to the uterus is also ligated, either unilaterally or bilaterally. Unilateral or bilateral ligation of the internal



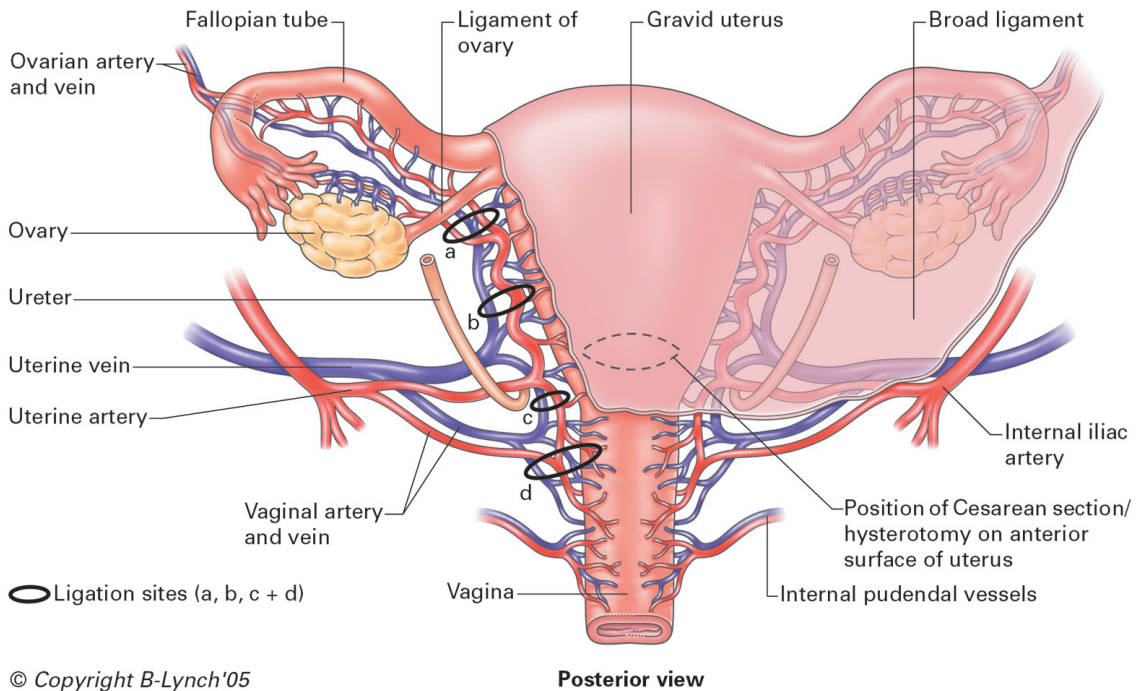
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**Figure 5** The Hayman uterine compression suture without opening the uterine cavity<sup>11</sup>

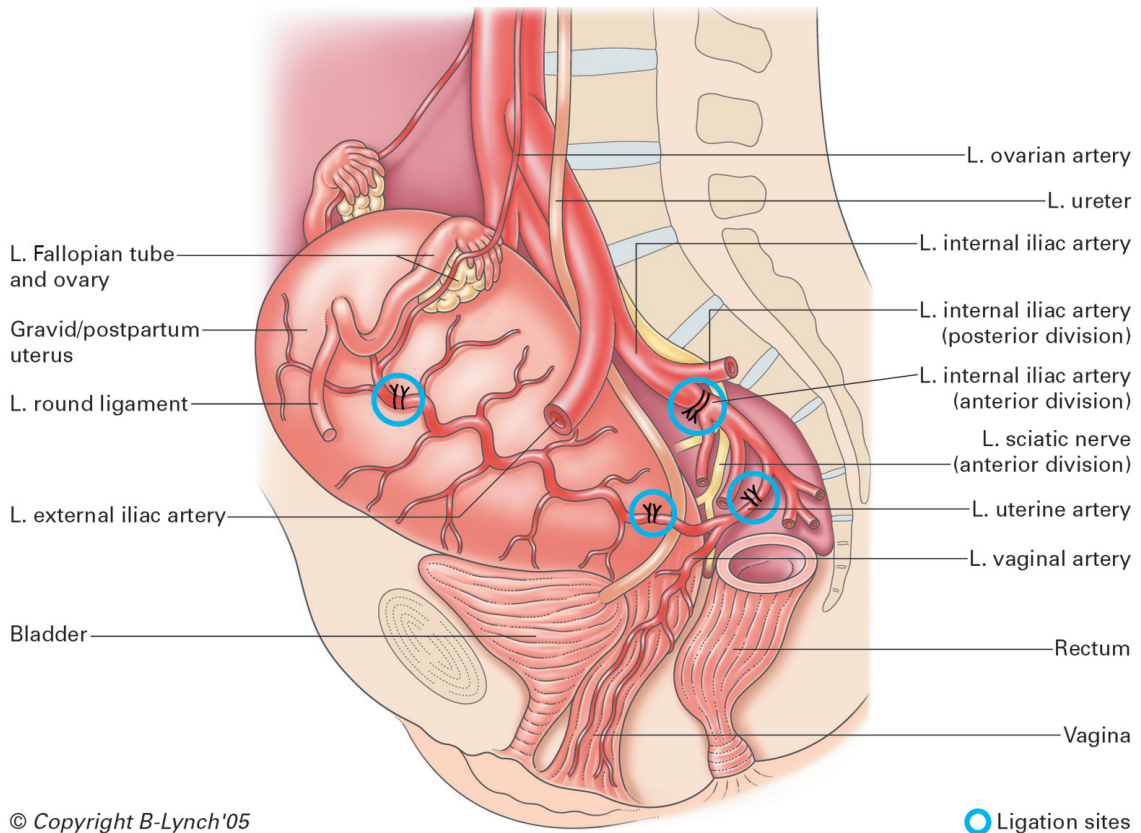
**Figure 6** The Cho multiple square sutures compressing anterior to posterior uterine walls<sup>12</sup>




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Posterior view

**Figure 7** Placement of ligatures in the process of stepwise devascularization, including ligation of the descending uterine and vaginal arteries



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 Ligation sites

**Figure 8** The complex vascular distribution to the pelvic organs. In this procedure of stepwise devascularization, the patient must be in the Lloyd Davis or modified lithotomy position, with one of the assistants able to access and swab the vagina to assess bleeding control

iliac artery may become necessary as a further step to control massive postpartum hemorrhage. A skilful surgeon should aim to ligate the anterior division of the internal iliac artery in order to achieve further devascularization of the uterus without compromising blood supply to the posterior division. However, ligation of the internal iliac directly could be done unilaterally or bilaterally without devascularizing the pelvic organs<sup>8,26</sup>. This may save time, life and organ.

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