

INTERVENTIONS IN OBSTETRICS AND GYNECOLOGY : A CONCISE REVIEW

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Abstract: Clinico-imaging interventions are indispensable for a multitude of invasive procedures in the female pelvis. The common imaging modalities used for Interventions in Obstetrics & Gynecology, comprise Ultrasonography (USG), DSA, CT Scan and MRI. Amongst them ultrasonographic (USG) guidance, either by transabdominal, endovaginal, or endorectal is a powerful tool, whose advantageous features are safety, avoids ionizing radiation, convenient, easy portability and facilitates bed side utility. Interventions in female pelvis can be categorised into Non-Vascular or Vascular. Common non-vascular techniques include Tuboovarian abscess drainage, Ovarian cyst/ abscess drainage, Uterine fluid collections drainage, Fallopian tube recanalisation and Antegrade stenting for obstructive uropathy. Common Vascular Interventions comprise of Uterine fibroid embolization, Post partum haemorrhage embolization, Tumor embolization, and Ovarian vein embolization. It must be remembered that timely intervention rather than masterly inactivity in dealing with female pelvic intervention cases forms the key to clinical success.

Key Words: Interventions in female pelvis; ultrasonographic (USG) guidance; Uterine fibroid embolization

INTRODUCTION

Clinico-imaging interventions are increasingly useful in a variety of Obstetrics and Gynecology entities, including few life-threatening conditions. Amongst them ultrasonographic (USG) guidance, either by transabdominal, endovaginal, or endorectal is a powerful tool. USG guided procedures can be performed quickly, safely and avoids ionizing radiation, a concern in the young fertile patients¹. Ultrasonography additionally offers unique advantages like convenience, portability, bed side availability, and flexibility. Besides, USG enables quick applications at varied locations like Radiology Department, operating room, patient examination room, ICU or labour room.

Interventions in female pelvis can be categorised for convenience into Non-Vascular or Vascular. Common non-vascular techniques include Tuboovarian abscess drainage, Ovarian cyst/ abscess drainage, Uterine fluid collections drainage, Fallopian tube recanalisation and Antegrade stenting for obstructive uropathy. Common Vascular Interventions comprise of Uterine fibroid embolization, Post partum haemorrhage embolization, Tumor embolization, and Ovarian vein embolization. Most non-vascular interventions are performed using Ultrasonography or DSA systems, while vascular interventions largely are performed under a setting of DSA.

NON-VASCULAR INTERVENTIONAL TECHNIQUES

Drainage of abscesses

Pelvic abscesses can be due to a variety of causes like tubo-ovarian, uterine fluid collections, appendiceal, diverticular, inflammatory bowel abscesses, and peritonitis related collections. Two endovaginally guided techniques have been advocated, namely: a) Seldinger technique with sequential placement of a needle and a J-wire, followed by dilation and placement of a self-retaining drain and b) Trocar technique with a single-step placement of a drainage catheter with a stiffened stylet¹.

Besides abscesses, other collections amenable to drainage include loculated ascites, pseudocysts surrounding ventriculoperitoneal shunt tips, urinomas, resolving hematomas, lymphoceles, peritoneal inclusion cysts, and pancreatic pseudocysts or effusions^{1,2}. Access point is perhaps the most important issue to be considered in a given case of drainage, prior to the actual procedure. Alternative drainage routes such as "anterior abdominal, posterior transgluteal, and transrectal approaches are possible but may be more painful or require CT guidance". It is for these reasons, transvaginal guided drainage procedures have become increasingly useful in pelvic interventions³. Transvaginal Aspiration and Biopsy has been used for a) therapy of recurrent endometriotic cysts in the ovary or adnexa; b) therapy of recurrent hemorrhagic ovarian cysts; c) therapy of postoperative cystic adnexal collections; and d) diagnosis of ovarian cysts in selected patients³.

In transvaginal guided drainage procedures, most collections can be reached with a 20–25-cm-long (20 or 22 gauge) needle, often without local anesthetics. A typical procedure

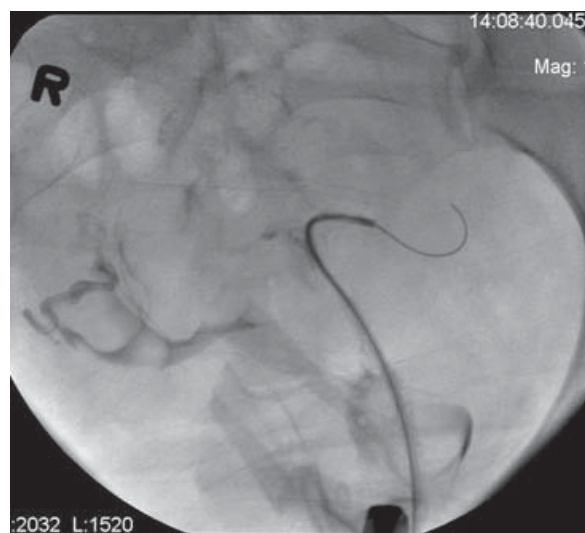


Figure 1A) : Fallopian Tube Recanalisation : A preprocedure HSG determines the site of the block

involves simple aspiration or when returning aspirate is purulent / serous or serosanguineous in an afebrile patient, placement of a drainage catheter. Furthermore, aspirates should be sent for Gram stain, culture and sensitivity and cytologic examination.

ASPIRATION OF OVARIAN CYST

USG guided aspiration of ovarian cysts must be preceded by a diagnostic endovaginal study to evaluate the features of the cyst and determine the shortest, safest needle route, avoiding intestine, bladder and vascular structures⁴. Color Doppler examination augments planning.

This procedure is ideal for aspiration of simple ovarian cysts in pre-and perimenopausal women in whom the risk of malignancy is low. Aspiration of symptomatic ovarian cysts that has benign morphological features at USG with an endovaginally or transabdominally guided small-gauge needle is simple and effective. Currently, this form of therapy is slowly replacing the classic therapy for persistent symptomatic cysts i.e. surgical extirpation by laparoscopy or open laparotomy, procedures that have risks associated with anesthesia and bleeding, bowel perforation, infection, and adhesion formation. It is advisable to avoid aspiration of cysts with features of mature cystic teratoma (hyperechoic mural plug, fat-fluid level, hair matrix), and complex cysts. these require surgical excision.

FALLOPIAN TUBE RECANALISATION

This is a simple and effective procedure used to treat primary and secondary infertility⁵. Use of selective salpingography and fallopian tube recanalization has revolutionized the diagnosis and treatment of infertility⁶. In fallopian tube recanalization, a catheter and guide wire system is used to clear proximal tubal obstructions. The recanalization procedure is simple for interventional radiologists to perform and is successfully completed in most patients (71%-92%).

Pregnancy rates after the procedure have been variable, with an average rate of 30%⁵.

A preprocedure HSG determines the site of the block (Figure 1A). The disposals for the procedure include a canula, a guiding catheter, selective Cobra catheters, hydrophilic guide wires and contrast. With the help of canula, guiding catheter, the selective Cobra catheters is manipulated under fluoroscopy to the site of the block. The block is opened out with the help of hydrophilic guide wire⁶. A check injection of contrast is made to confirm the opening of the Fallopian tubes. The end point is a patent tube with peritoneal spill. The patients are followed up for confirmation of conception (Figure 1B).

OBSTRUCTIVE UROPATHY

This morbid entity occurs in women presenting with carcinoma cervix, due to local spread with infiltration at the bladder base, causing obstruction to the lower ureter. They can be unilateral or bilateral. After an initial percutaneous nephrostomy the obstruction is crossed with a hydrophilic wire. Then by serially dilating the strictured segment of the lower ureter, a D-J stent is inserted that negotiates the strictured segment and allows urine to pass freely into the urinary bladder, thereby relieving the symptoms and signs of obstructive uropathy. (Figure 2A and 2B).

INTERVENTIONS IN EARLY PREGNANCY

USG guided procedures in pregnancy are safe and help in diagnosis and treatment of compromised fetus. A variety of procedures can be utilized in early pregnancy, to solve special issues Ectopic pregnancy can be treated by injecting Methotrexate into the gestation sac by transvaginally guided needle. Amniocentesis is a specialized intervention procedure

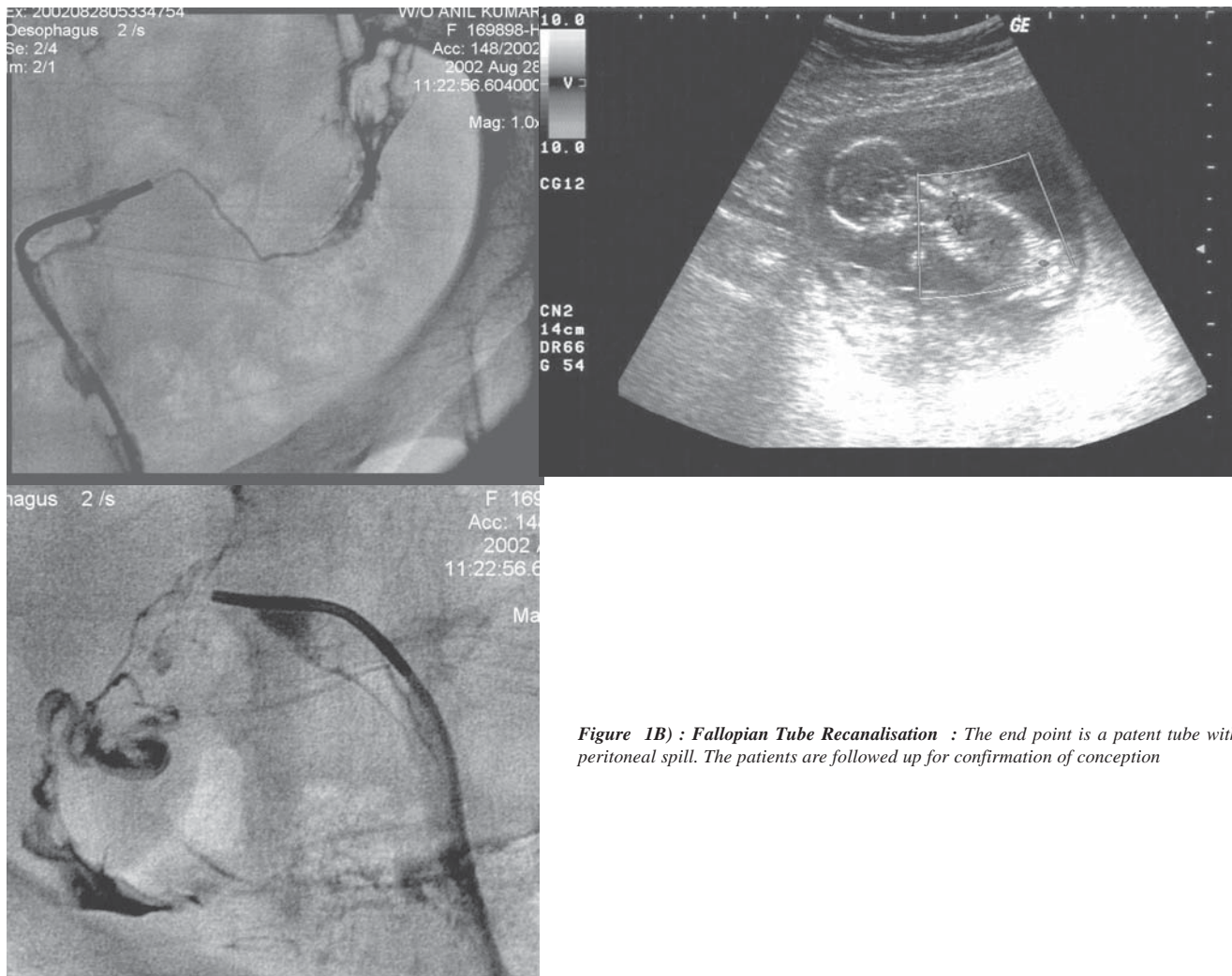


Figure 1B) : Fallopian Tube Recanalisation : The end point is a patent tube with peritoneal spill. The patients are followed up for confirmation of conception

used to derive samples of amniotic material. Indications of amniocentesis include a) diagnosis of genetic disorders and b) fetal maturity.

Chorionic Villous Biopsy is indicated in early diagnosis of genetic disorders. It is less traumatic under USG guidance. However chances of fetal limb deformity is present if done less than 10 weeks. Coelocentesis is performed between 6-12 weeks for prenatal diagnosis of chromosomal and genetic disorders. There is a 95% success rate, in this period, because of low rate of contamination by maternal cells. Amniopatch is used to patch up defect in amniotic membranes in cases of premature rupture membranes (PROM).

The procedure for Amniopatch entails use of one unit of maternal blood, platelets and cryoprecipitate. USG guided injection of these into amniotic cavity takes only a few minutes. The mechanism of action is that platelets activate the clotting mechanism and the cryoprecipitate acts like a cement to hold the platelets in place. It can take 2 weeks for the membrane to reattach. Cordocentesis is useful in

umbilical cord catheterization and fetal blood exchange transfusions. It is also useful in nutrient supplementation, in Gene therapy and in treatment of infection. The catheter is in vein for 30 - 210 minutes.

VASCULAR INTERVENTIONAL TECHNIQUES

Uterine Artery Embolisation for Uterine Fibroids

Uterine Fibroids are benign neoplasms of smooth muscle origin that affect 25-40% of women over 35 years. Common presentation of symptomatic uterine fibroids is menorrhagia, which often leads to iron deficiency, dyspareunia, low back pain, frequency of urination, constipation and infertility. Uterine-sparing treatment options for patients with symptomatic uterine fibroids include medical management with Gn Rh analogue, Danazol, or surgical procedures like Abdominal myomectomy, Laparoscopic myomectomy, Laparoscopic myolysis, and Hysteroscopic resection. Of late, Uterine Fibroid Embolization (UFE) is a promising

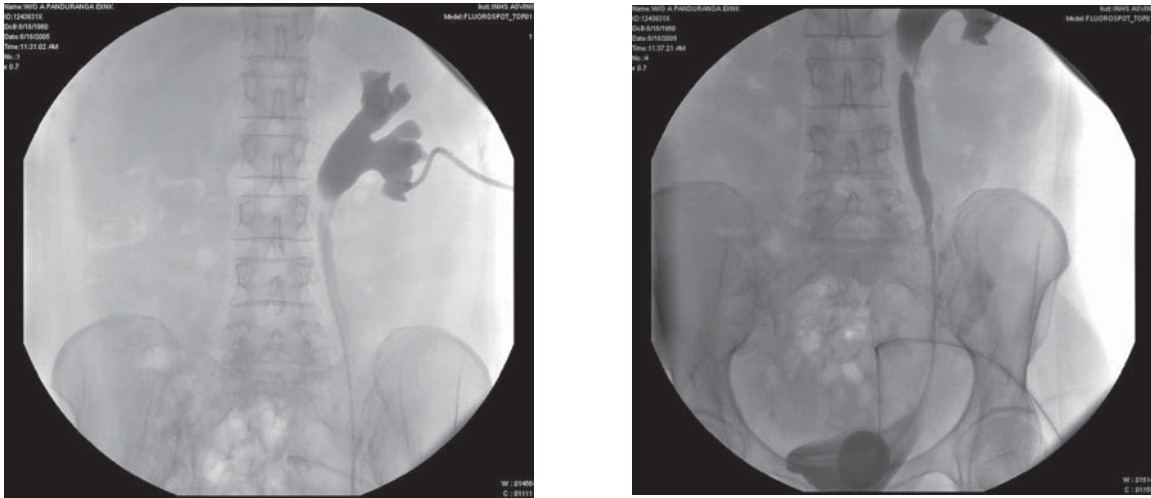


Figure 2 A) : Obstructive Uropathy: By serially dilating the strictured segment of lower ureter, a D-J stent is inserted

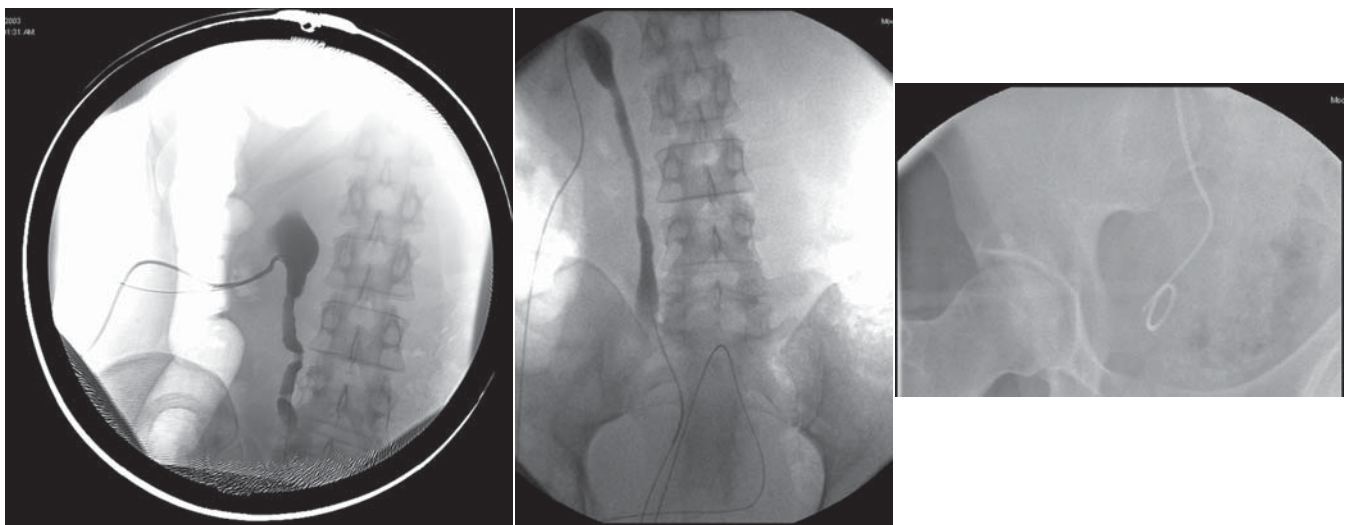


Figure 2B) Obstructive Uropathy: DJ Stent negotiates the strictured segment and allows urine to pass freely into the urinary bladder, thereby relieving the symptoms and signs of obstructive uropathy

interventional technique found effective in selected cases of fibroid⁷.

The advantages of UFE includes a) no blood loss ; b) no general anesthesia or surgical incisions; c) recovery and hospitalisation are significantly shorter ; d) all fibroids are treated at once, which is not the case with myomectomy; e) recurrence rates appear to be lower than those of myomectomy; and f) early menopause-like syndrome is rare as compared with gonadotropin-releasing therapy.

A standard percutaneous transfemoral approach, invariably via the right side, is usual. Some radiologists find it easier to catheterise both arteries using a bilateral approach and selectively catheterising the contralateral as opposed to the

ipsilateral uterine artery. A guide wire is then manipulated until it engages in the uterine artery. Limited arteriography at this stage additionally allows assessment of the vascularity and size of the fibroid uterus. (Figure 3A). When the correct position of the catheter has been confirmed, embolisation particles if Polyvinyl Alcohol and/or Gelfoam (Table 1) are slowly injected into the uterine artery, where they wedge in the smaller vessels blocking the flow of blood. The absence of distal flow in the uterine artery will be clearly seen on X-ray fluoroscopy. (Figure 3B).

Disadvantages include a) effect on fertility is still uncertain⁸ ; b) late infection occurs in a small percentage of patients and c) long-term follow up data is not available⁹.

Table 1: *Characteristics of Polyvinyl Alcohol and Gelfoam (35). Adapted from reference [10]*

Characteristic	Polyvinyl Alcohol	Gelfoam
Physical properties	Nonbiodegradable Synthetic	Biodegradable Prepared from purified skin gelatin
Mechanism of action	Acute inflammation mural angionecrosis, fibrosis, and thrombosis	Acute panarteritis with disruption of elastic tissue and thrombosis
Duration of occlusion	Several months with the potential for recanalization	30–45 days
Advantages	Easy to administer after selection of particle size Variable sizes available	Ideal for temporary occlusion
Disadvantages	Possibility for different size particles in preparation Potential for proximal occlusion caused by particle aggregation Nonradiopaque	Tedious to prepare Variable sizes of pledgets Nonradiopaque
Indications	Permanent embolisation	Temporary embolisation

Post Partum Haemorrhage

Obstetric haemorrhage is a potentially cause for maternal morbidity and death. Its causes include uterine atony, retained

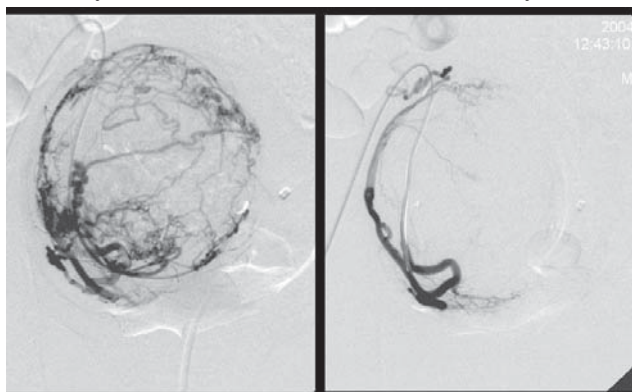


Figure 3A) : Uterine Artery Embolisation for Uterine Fibroids: Preliminary arteriography allows assessment of the vascularity and size of the fibroid uterus. Following embolisation with particles (Polyvinyl Alcohol and/or Gelfoam) into the uterine artery, an absence of distal flow in the uterine artery is the endpoint.

products of conception, placental abnormalities, uterine rupture, lower genital tract laceration, cervical ectopic pregnancy and coagulopathies. In general, “patients with postpartum haemorrhage (PPH) are primarily managed by vaginal packing, uterine massage and intravenous administration of oxytocin or methylergonovine for uterine atony, curettage for retained placenta, and suturing of lacerations”¹¹.

Conventional management in cases of persistent vaginal bleeding is by way of bilateral internal iliac artery ligation and occasionally hysterectomy¹². Transcatheter arterial embolization is now considered to be a superior technique replacing bilateral internal iliac artery ligation in major centres, more so with available facilities for interventional radiology¹³. (Figure 4A&B).

In management of post-operative, post-abortion and postpartum intractable bleeding, with normal coagulation, its overall success rate of is over 90%. The advantages of UAE include: “preservation of the fertility¹⁴; decreased incidence of rebleeding from collaterals due to more distal occlusion obtained with embolization than with surgical

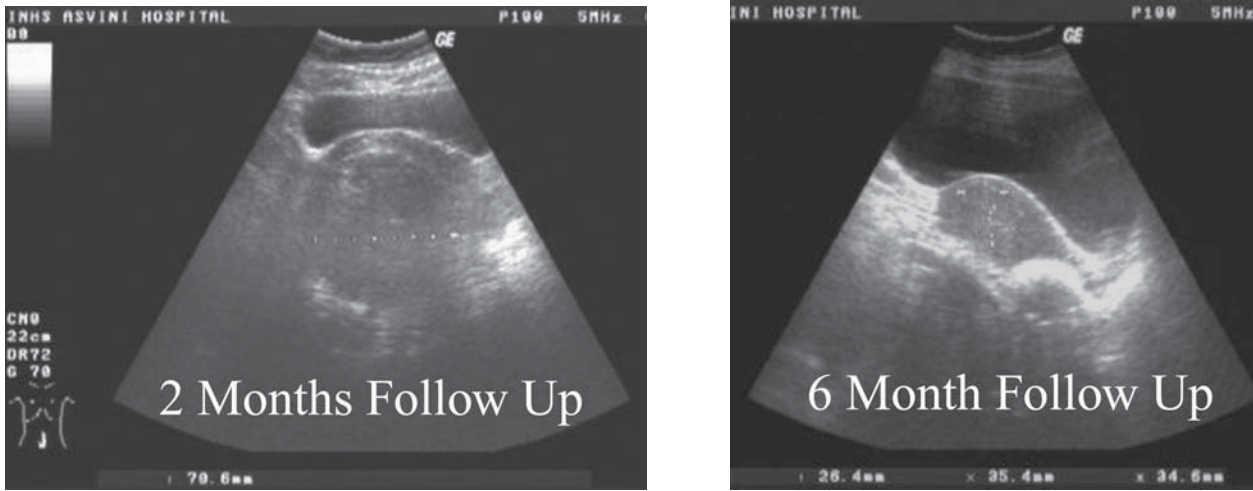


Figure 3B) : Uterine Artery Embolisation for Uterine Fibroids : long-term follow up ultrasonography showing regression of fibroid lesion

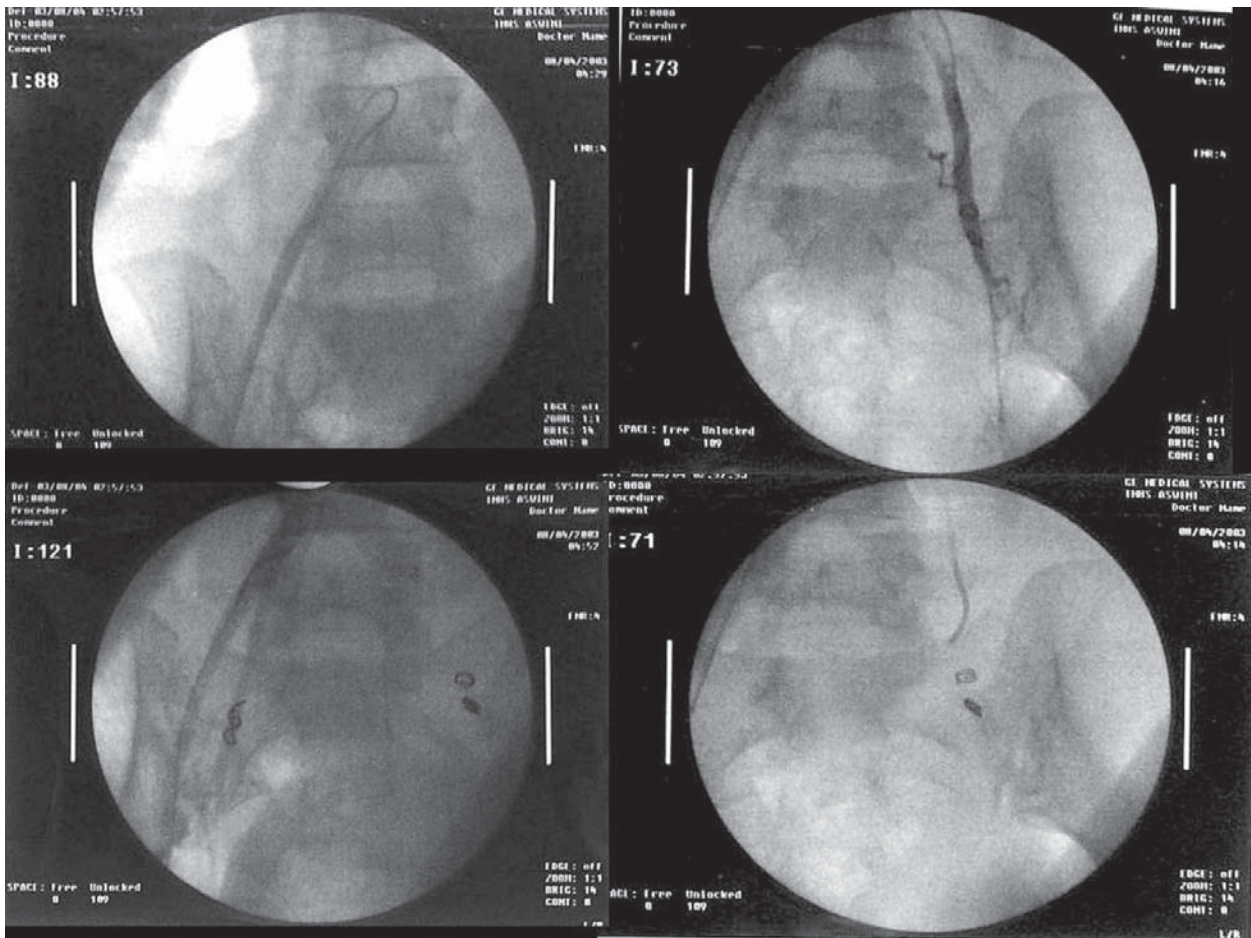


Figure 4 A) Post Partum Haemorrhage : Transcatheter arterial embolization was chosen over bilateral internal iliac artery ligation in a middle aged lady with intractable life threatening Post Partum Haemorrhage. Selective Diagnostic angiography in this case was non-contributory. Angiography shows successful and complete blockage of both internal iliac arteries

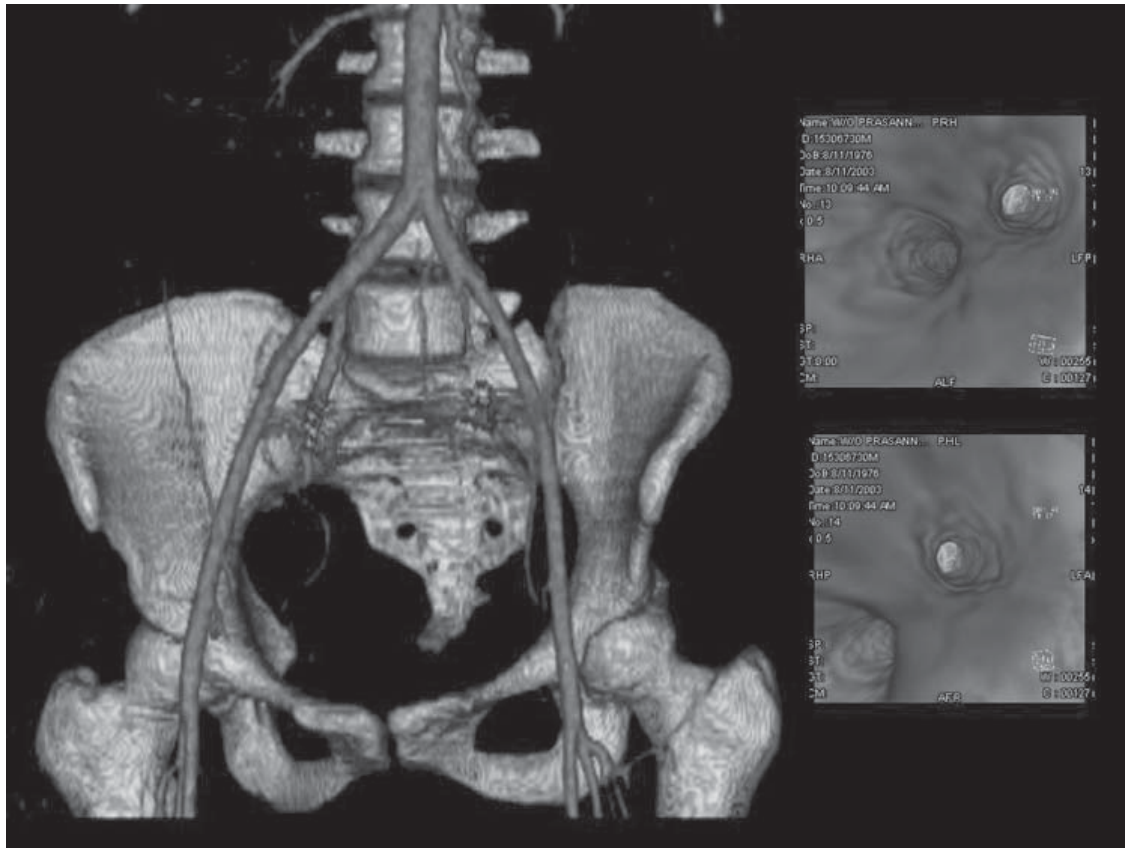


Figure 4 B) Post Partum Haemorrhage : 3D Volume Rendered Multidetector CT Angiography shows successful and complete blockage of both internal iliac arteries. Virtual Scopy images shows intraluminal perspective of the the blockage

ligation; and the ability of radiologist to visualize, catheterize and occlude collateral vessels contributing to bleeding”¹¹.

CONCLUSION

A variety of interventional techniques in Obstetrics and Gynecology have been established, addressing few common entities, encountered in clinical practice. Interventional procedures in the female pelvis range from subtle to life threatening. These can be categorized into vascular and non vascular indications. It must be remembered that timely intervention rather than masterly inactivity forms the key to success.

REFERENCES

1. Scanlan KA, Propeck PA, Lee FT, Jr. Invasive Procedures in the Female Pelvis: Value of Transabdominal, Endovaginal, and Endorectal US Guidance. *RadioGraphics* 2001; 21:491–506
2. Reuter KL. Critical uses of intraoperative gynecologic sonography. *Am J Roentgenol* 1997; 169:541–546.
3. O’Neill MJ, Rafferty EA, Lee SI, Arellano RS, Gervais DA, Hahn PF, Yoder IC, Mueller PR. Transvaginal Interventional Procedures: Aspiration, Biopsy, and Catheter Drainage. *RadioGraphics* 2001; 21:657–672
4. Troiano RN, Taylor KJW. Sonographically guided therapeutic aspiration of benign-appearing ovarian cysts and endometriomas. *Am J Roentgenol* 1998; 171:1601–1605.
5. Thurmond AS, Machan LS, Maubon AJ, Rouanet JP, Hovsepian DM, Van Moore A, Zagoria RJ, Dickey KW, Bass JC. A review of selective salpingography and fallopian tube catheterization. *Radiographics* 2000 Nov-Dec;20(6):1759-68
6. Thurmond AS, Novy M, Uchida BT, Rosch J. Fallopian tube obstruction: selective salpingography and recanalization. *Work in progress. Radiology* 1987 May;163(2):511-4 7. Ravina J, Herbreteau D, Ciraru-Vigneron N, et al. Arterial embolisation to treat uterine myomata. *Lancet* 1995; 346:671–672.
8. Spies JB. Uterine Artery Embolization for Fibroids: Understanding the Technical Causes of Failure *J Vasc Interv Radiol* 2003; 14:11–14
9. Andersen PE, Lund N, Justesen P, et al. Uterine artery embolization for symptomatic uterine fibroids: initial success and short-term results. *Acta Radiol* 2001; 42:234–238.
10. Siskin GP, Englander M, Stainken BF, Ahn J, Dowling K, Dolen EG. Embolic Agents Used for Uterine Fibroid Embolization. *AJR* 2000;175:767–773
11. Hong TM, Tseng HS, Lee RC, Wang JH, Chang CY. Uterine artery embolization: an effective treatment for intractable obstetric haemorrhage *Clinical Radiology* 2004;59, 96–101
12. Collins CD, Jackson JE. Pelvic arterial embolization following hysterectomy and bilateral internal iliac artery ligation for intractable primary post partum haemorrhage. *Clin Radiol* 1995;50:710–4.
13. Pelage JP, Le Dref O, Mateo J, et al. Life-threatening primary postpartum hemorrhage: treatment with emergency selective arterial embolization. *Radiology* 1998;208: 359–62.
14. Goldberg J, Pereira L, Berghella V. Pregnancy after uterine artery embolization. *Obstet Gynecol* 2002;100:869–72.