SONOGRAPHIC DIAGNOSIS OF UTERINE ARTERIOVENOUS MALFORMATIONS
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ABSTRACT
Uterine arteriovenous malformation is a rare entity, misdiagnosis of which could lead to catastrophic results. Non-familiarity of this condition among sonologists is the main reason for its missed diagnosis. There are only over 100 cases reported in a literature to the best of our knowledge, however, in the experience of authors, it is not that rare as we diagnosed 3 cases in a span of 1½ years while working in a public sector hospital with Doppler facility. Its incidence is probably increasing with the increasing rates of dilatation & curettage and cesarean sections. Colour Doppler study proves to be the non-invasive, real time, readily available modality with high sensitivity and high positive predictive value. MRI is useful for the confirmation of diagnosis as well as depicting the extent of malformation.

Keywords: Arteriovenous Malformation, Colour Doppler Ultrasound, Dilatation & Curettage.

INTRODUCTION
Uterine arteriovenous malformation (AVM) results from multiple arteriovenous fistulous communications without intervening capillary network. Congenital and acquired forms have been recognized. Radiological differentiation between them is often difficult and diagnosis is usually based upon history. Associations include multiple pregnancies, miscarriages and prior uterine instrumentation or surgery that would have disrupted the endometrial layer like dilatation and curettage (D&C) and cesarean (C) sections. Bleeding Pervaginum (p/v) is the major presenting complaint. It is thought to arise either from natural sloughing of endometrium during menstrual cycle or iatrogenically as a complication of D&C causing desquamation of endometrium exposing the malformed vessels.

CASE REPORT
A 30 years old, married female with 3 alive children and history of three 1st trimester miscarriages presented with off and on heavy P/v bleeding for the last 2 ½ months. She had undergone two D&Cs and one C-section in the past. She underwent last D&C 5 years back and her last C-section was done 4 years ago. She went to a midwife for these complaints 2 months back where her D&C was carried out and she had heavy P/v bleeding with clots. Bleeding was so profuse that 2 pints of blood were transfused. On admission, her hemoglobin was 9.0 g/dL, urine pregnancy test was negative and serum βhCG levels were 1mIU/L. Her baseline ultrasound pelvis showed retained products of conception (RPOCs) but since she was not pregnant and her βhCG level was in non-pregnant range, she was advised sonographic re-evaluation.

Her trans abdominal ultrasound showed thickened anterior myometrium with subtle heterogeneity. Colour Doppler ultrasound revealed intense colour fill in. Endometrial cavity was empty. Her transvaginal sonography (TVS) was carried out showing multiple anechoic spaces of variable sizes and shapes in anterior myometrium. Colour Doppler sonography showed extensive vascularity completely filling these anechoic spaces with chaotic pattern of vessels and juxtaposed signals of reds and blues interspersed with area of yellow colours suggesting turbulent multidirectional flow. (Fig-1a). Spectral Doppler study showed high velocity, low resistance arterial pattern with RI of 0.29 (Fig-1b) along with spiky turbulent high velocity venous
pattern suggesting arteriovenous shunting along with prominent parametrial vessels (fig-1c). Based on these findings, a diagnosis of uterine AVM was given. For further confirmation she was advised contrast enhanced MRI pelvis. T1 and T2 weighted images showed multiple tortuous signal voids in the anterior uterine wall displacing the endometrium posteriorly (Fig-2 A & B). Multiple prominent signal voids were also seen in the parametrium representing prominent vessels (fig-2b). Contrast enhanced fat suppressed images showed subtle marginal enhancement of these signal voids (fig-2c). Based on these findings the diagnosis of AVM was confirmed.

**DISCUSSION**

Uterine AVM is often misinterpreted as RPOCs because most of the times patients present with complaints of heavy P/V bleeding after miscarriage. False sonographic diagnosis often results from the presence of large clots distending the endometrial cavity and obscuring the endometrial margins causing some compression of the cystic spaces in the myometrium especially when the involved area is small. Therefore a high index of suspicion is necessary and colour Doppler interrogation of myometrium most of the times, reveals areas of abnormally high vascularity in the myometrium; while no vascularity would be seen in the blood clot placed in the endometrium. This was probably the cause of initial false diagnosis of RPOCs in the case of our patient as well. Furthermore TVS is the modality of choice for the diagnosis of AVM. Grayscale findings alone are non-specific and can have a range of appearances as subtle myometrium inhomogeneity, tubular/cystic spaces within the myometrium, an intramural, endometrial or cervical mass like region and...
prominent parametrial vessels\(^3\). The addition of colour doppler drastically improves the sensitivity and specificity of the sonographic diagnosis. Huang et al suggested two distinct colour patterns consistently associated with uterine AVMs\(^5\). The first is the juxtaposition of blue and red components, suggesting blood flow reversals caused by overlapping vessels of varying orientations and flow directions. The second is colour aliasing and the separation of red and blue components by yellow and white, suggesting focal high velocities.

Gestational trophoblastic disease and RPOCs and are two main differential diagnosis based on sonographic findings characterized by elevated βhCG levels. In case of gestational trophoblastic disease, βhCG would be markedly elevated while in case of RPOCs, either the levels are stable or show gradual decline as compared to the previous pregnancy levels. Sonographically RPOCs can be differentiated from AVM by being endometrium based while AVM is myometrium based. In invasive moles and choriocarcinoma, the involvement of myometrium with hypervascular areas could make the differentiation impossible but correlation with serial βhCG levels will clinch the diagnoses.

**CONCLUSION**

Trans vaginal colour and spectral Doppler study is sufficient for a confident diagnosis. MRI is used for confirming the diagnosis and depicting the extent of involvement. A correct diagnosis is imperative as D&C may lead to catastrophic results with life threatening bleeding.

**CONFLICT OF INTEREST**

This study has no conflict of interest to declare by any author.

**AUTHORS CONTRIBUTION**

Atiq Ur Rehman, Ayesha Zafar, Hidayat Ullah are manuscript writing and proof reading.

**REFERENCES**