Summary

Adenomyosis is defined by the intramyometrial presence of endometrial mucosa (glands and stroma) surrounded byreactive, hypertrophic myometrium. About one-third of adenomyosis cases are asymptomatic; in the remaining cases, the most frequent symptoms are menorrhagia (50%), dysmenorrhoea (30%), and metrorrhagia (20%). Occasionally, dyspareunia may be an additional complaint. The frequency and severity of symptoms correlate with the extent and depth of adenomyosis **(*Christine Bergeron et .al2006)***

Various imaging modalities have been used in the assessment of patients with suspected adenomyosis. These include hysterosalpingography (HSG), transabdominal ultrasound (TAS), transvaginal ultrasound (TVS), and most recently, magnetic resonance imaging (MRI). ***(MBalogun2006)***.

HSG has been used in assessing women with suspected adenomyosis with occasional characteristic findings . The most characteristic feature has been described as ill-defined areas of contrast intravasation, which extend from the uterine cavity into the myometrium in a perpendicular fashion ***(WeseleyAC et.al1998)***

The diagnostic criteria by TAS used in the different studies include an enlarged globular, regular uterus with no fibroids, myometrial cystic areas and a decreased myometrial echogenicity TAS alone has a limited diagnostic capacity for adenomyosis especially in women with co-existing fibroids .TAS is often performed in association with TVS, which results in a better diagnostic performance**.** ***(Bazot M et.al2002).***

The characteristics of adenomyosis seen in TVS reflect the location and amount of endometrial glands or stroma within the myometrium, and the associated typical muscular hypertrophy and hyperplasia. Adenomyosis is most often diagnosed by the presence of three or more sonographic criteria: heterogeneity, increased echogenicity, decreased

echogenicity, and anechoic lacunae or myometrial cysts ***(Dueholm et al.2007)***

Myometrial cysts in a poorly defined area with abnormal echo texture are highly specific for adenomyosis , but are only present in 40–60% of cases of adenomyosis. When cysts are not present, the presence of both hypo-echoic and heterogeneous areas may be needed to make a diagnosis . In contrast to myoma vessels that are located in the circumference of the myoma, in adenomyosis the blood vessels follow their normal vertical course in the myometrial areas, and this difference can be revealed by Doppler sonography ***(Dueholm et.al2007).***

The inner layer of the myometrium (the sub-endometrial halo) is hypoechogenic in TVS, but in MRI it is readily seen as a low-signal-intensity band on a T2-weighted image referred to as the junctional zone. The junctional zone is composed of longitudinally and circularly oriented, closely packed smooth muscle fibers parallel to the endometrium ***(Fusi L et.al2006).***

Like the endometrium the zonal anatomy is dependent upon gonadal hormones, with a thinner junctional zone thickness or an indistinct zonal pattern often seen in postmenopausal women or in women treated with gonadotropin-releasing hormone analogues or oral contraceptives The junctional zone normally increase in thickness with age to reach its peak at 41–50 years , and the junctional zone slightly increases in thickness throughout the menstrual cycle ***(Hauth EA 2007)***

Uncoordinated proliferation of the inner myometrial cells – junctional zone hyperplasia – may cause a focal or diffuse, thickened junctional zone, which can be a sign of the muscular hypertrophy seen in adenomyosis The changes in the junctional zone may precede or be the first signs of adenomyosis ***(Fusi L2006)***.

The accuracy of MRI for diagnosis of adenomyosis is dependent upon the used MRI sequences for image formation and should be a T2-weighted sequence. Moreover common pitfalls are uterine contractions

and uniform hormone dependent swelling of the junctional zone ***(Bazot M, 2003).***

The junctional zone thickness depends on hormonal status as mentioned above. Subjective impressions of junctional zone irregularity are commonly used for diagnosis of adenomyosis, but objective criteria are preferable. The ratio JZmax/total myometrium over 40% has been used , but is not useful in cases with coexistence of myomas and may reach this level even in normal patients without adenomyosis The difference between the maximum and minimum thickness , which measures the degree of irregularity of the junctional zone, may be preferred, and a difference of more than 5mm was a slightly better diagnostic marker of adenomyosis than JZmax in premenopausal women Criteria for identification of adenomyosis using MRI have been established , but as they are still largely dependent on subjective criteria, they could be improved through further study. ***(Hauth EA et.al2007),***

Several studies have demonstrated a high accuracy of MRI for diagnosing adenomyosis with a sensitivity and specificity ranging from 86 to 100% This is particularly so in the symptomatic patient ***(MBalogun2006)***

Adenomyoma is a localized and well-circumscribed form of adenomyosis. Recognition of this entity is of clinical importance because adenomyomas are frequently confused with leiomyomas, not only on MR imaging but also at pathological examination. On MR imaging, myometrial adenomyomas typically exhibit low signal intensity on T2-weighted image which may closely simulate leiomyoma. When the lesion is accompanied by hyperintense foci representing ectopic endometrium on T2-weighted images, MR imaging can allow correct diagnosis of this entity .Unlike the ordinary form of adenomyosis, myometrial adenomyoma can be treated surgically with myomectomy. ***(Tamai et al 2006).***

Adenomyomatous polyp (polypoid adenomyoma) presents as a pedunculated or sessile polypoid mass in the lower uterine endometrium or endocervix, and accounts for about 2% of all endometrial polyps. It

typically affects premenopausal women, presenting as abnormal genital bleeding. On MR imaging, the lesion typically presents as a hypointense polypoid mass representing myometrial tissue, associated with hyperintense foci on T2-weighted images.The recognition of the attachment site of the polypoid lesion and the typical signal pattern on MR imaging may allow preoperative diagnosis of polypoid adenomyoma. Atypical polypoid adenomyoma is a rare variant of a polypoid adenomyoma, microscopically characterized by architectural and cytologic atypia. MR findings are similar to those of an ordinary polypoid adenomyoma and may reveal a haemorrhagic cyst within the lesion . ***(Tamai et.al 2006).***

Adenomyotic cyst is a rare variant of adenomyosis characterized by the presence of a large haemorrhagic cyst resulting from extensive menstrual bleeding in the ectopic endometrial gland. The lesion can be entirely within the myometrial, submucosal or subserosal tissue. On MR imaging, fluid content exhibits high signal intensity on T1-weighted images, and the surrounding solid wall exhibits a distinct low signal intensity on T2-weighted images***. (Tanaka YO et. al.2004).***

The appearance of adenomyosis may occasionally fluctuate according to the hormonal status. In luteal phase, the hyperintense foci on T2-weighted images representing ectopic endometrial tissue within adenomyosis may predominate in the lesion, and this MR feature may simulate infiltrating malignancy in the myometrium. Subsequent MR study in the proliferative phase may show shrinkage of these high-intensity foci, obviating misdiagnosis Although adenomyosis is rare in postmenopausal women, it can be seen in association with either endogenous hormonal stimuli from oestrogen-producing tumours or an exogenous hormone such as tamoxifen ,which is a non-steroidal anti-oestrogen agent widely used for breast cancer treatment and can also act as an oestrogen agonist ***. (Ascher SM et.al2000).***

MR imaging is also helpful in monitoring the treatment effect of hormonal therapy.In response to therapy with gonadotrophin-releasing hormone (GnRH) analogue (GnRHa), the margin of focal myometrial adenomyosis may become more discrete, and adenomyosis with

thickened JZ may decrease in thickness. Imaoka et al have reported that adenomyosis presenting as focal thickening of the JZ with hyperintense foci on T2-weighted images tends to be more sensitive to hormonal therapy, while adenomyosis presenting as diffuse thickening of the JZ tends to be resistant ***(Pelage JP et. al2005).***

The commonest differential diagnosis of adenomyosis is leiomyomas. They both have a similar clinical presentation and often co-exist. There is also some overlap in the imaging appearances. Their differentiation is critical for these reasons as well as the different therapeutic options. At imaging, leiomyomas generally tend to have clearly defined margins, a mass effect, globular shape and peripheral/marginal vessels. At TVS, they may be calcified,have a whorled appearance with edge shadowing and lack the diffuse linear striations of adenomyosis ***(M .Balogun 2006).***

AT MRI leiomyomas lack the hyperintense linear striations, which are specific for adenomyosis. They are also not related to diffuse thickening of the junctional zone . They may however be indistinguishable from adenomyomas, which are better circumscribed than the diffuse form and may exhibit a mass effect. Myometrial contractions may appear similar to focal adenomyosis with a focal thickening of the junctional zone. These are however transient and change over time. Some studies have advocated the use of dynamic scans to assess the myometrial contractility Adenomyosis may co-exist with endometrial carcinoma giving rise to staging errors. It may also mimic carcinoma at imaging. ***(Bazot M, et al.2002).***

Numerous studies have compared the accuracy of MRI and ultrasound scanning in the diagnosis of adenomyosis The earlier studies suggested MRI had higher accuracy than TVS while the later studies reported similar accuracy figures. It is felt that the discrepancy may be explained by the technological improvements in ultrasonography as well as the study population.TVS has several advantages over MRI. It is widely available, relatively inexpensive compared to MRI. It is well tolerated by most patients and generates high quality images not limited by patient size or uterine position. However, it has its limitations. It is

operator-dependent and may not be reproducible in patients on follow-up. The presence of intramural fibroids can hinder assessment of the adjacent myometrium. MRI, on the other hand, is less operator-dependent. Some authors recently suggested that the accuracy for the diagnosis of adenomyosis is highly influenced by the radiologist's experience in MR imaging of the female pelvis .The images are standard and reproducible. The presence of fibroids does not affect the diagnostic accuracy of MRI as it does in TVS. MRI is less widely available, however, it is not suitable for all patients and is more expensive. ***(M. Balogun2006).***

The combined use of MRI and TVS produced the highest Sensitivity ,but at the expense of a lower specificity.Evalu-ation of contradictory findings by consensus or confirmation by image –directed hysteroscopic biopsies should be considered .Moreover, further studies should be conducted to ex-plore the possibilities for more optimal use of MRI in the diagnosis of adenomyosis ***.(Dueholm et.al 2007).***

Conclusion

The non-invasive diagnosis of adenomyosis is no longer elusive with the advent of high resolution imaging techniques such as TVS and MRI. Both have been demonstrated to have similar levels of accuracy and each have a role in the evaluation of women suspected to have adenomyosis. TVS is useful as an initial imaging tool while MRI can be reserved for indeterminate cases on TVS and for monitoring patients on hormonal treatment. It is imperative that sonographers are familiar with the ultrasound features of adenomyosis as it presents in a similar fashion to many other gynaecological conditions. Radiologists reporting on MRI of the female pelvis also need to be aware of the MRI features of adenomyosis and the potential pitfalls.