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REVIEW ARTICLE

Sonographic Comparison between PCOS, Hyperstimulated Ovaries and Hyperreactio Luteinalis

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ABSTRACT

Background: Polycystic Ovarian Syndrome (PCOS) is a highly prevalent endocrinological disorder of females characterized by hirsutism, infertility and bilaterally enlarged multicystic ovaries.It is also a risk factor for development of Ovarian Hyperstimulation Syndrome (OHSS) and Hyperreatcio luteinalis (HL).
Aim: To identify the value of ultrasonography in distinguishing these three interlinked pathologies and highlight the need for additional relevant investigations to make confirmatory diagnosis of any of them.
Method: We conducted a systematic search by using Google Scholar and PubMed as search engines to retrieve all the available English-language literature on ultrasonographic findings of PCOS, OHSS and HL published from 2016 to 2021 while following PRISMA Statement.
Results: Out of 316 articles retrieved ,only 9 articles were found that met the preset inclusion and exclusion criteria and of which there were 8 case reports and 1 narrative review.
Conclusion: PCOS, OHSS and HL are interrelated ovarian morphological abnormalities with almost same ultrasonographic features.Correlation of these features with other relevant lab investigations and clinical parameters is therefore necessary to make an individual diagnosis out of them.
Keywords: Ultrasound features**,** PCOS, Polycystic ovarian syndrome, Ovarian Hyperstimulation syndrome, Multicystic ovaries

INTRODUCTION

Pelvic Ultrasonography has made significant advancements in diagnosis of various ovarian morphological disorders like Polycystic Ovarian Syndrme (PCOS), Ovarian Hyperstimulation Syndrome (OHSS) and Hyperreactio luteinalis (LH)[1]. PCOS, most prevalent endocrinological pathology of females in reproductive age, is characterized by hyperandrogenemia, chronic anovulation and ultrasonographic findings of bilaterally enlarged multicystic ovaries[2,3,4]. The criteria for diagnosis of PCOs include presesnce of more than 12 follicles within 9mm of ovarian surface approximately, arrangement of ovarian follicles on the periphery of ovaries, volume greater than 10cm and highly echogenic areas of ovarian stroma[2]. OHSS is an iatrogenic complication of artificial ovulation induction by GnRH agonists or clomiphene[5]. It results from ovarian enlargement owing to growth of cysts and extravasation of fluid due to hyperpermeability of ovarian stromal vasculature[6]. It may occur spontaneously in patients suffering from PCOS or hypothyroidism whereas HL is a rare cystic disorder of ovaries that is characterized by bilateral ovarian enlargement and multiple cysts[7]. Both LH and OHSS occur in pregnancy under the influence of β-hcg and settles as the level of β-hcg falls but OHSS mostly occurs in first trimester of pregnancy and HL is prevalent in third trimester of pregnancy. PCOS confers greater risk for development of both OHSS and HL in a female patient during pregnancy[5,7]. Clinical presentations and Ultrasonographic imaging findings of all the three conditions seems quiet similar due to interrelated pathogenesis[8,9,10].

We therefore reviewed literature to compare the ultrasonographic findings in PCOS, OHSS and HL and to know whether pelvic ultrasound alone is enough for the gynecologists to distinguish these three distinct pathologies or they need additional investigations to make accurate diagnosis.

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METHODS

Search Strategy: We searched the literature from 15th Dec, 2021 to 23 Dec, 2021 by using Google Scholar and Pubmed databases and following PRISMA guidelines[11]. Ultrasound features, PCOS, Polycystic Ovarian syndrome, Ovarian Hyperstimulation syndrome and Multicystic ovaries were our keywords. Only articles published in English language were recruited.Duplicates were removed manually and snowballing method was applied to the references of eligible articles to expand our research. Studies which explain ultrasonographic findings in PCOS, OHSS and multicystic ovaries were included where studies were excluded on the basis of following criteria:
(a) No free access
(b) Deals with pediatric o adolescent population
(c) Publications in languages other than English
(d) Systematic Reviews, commentaries, editorials

RESULTS

Total 316 articles were initially identified. After removal of duplicates and screening on basis of preset exclusion and inclusion criteria. 9 articles were found.Out of these 9 articles, there were 8 case reports and 1 narrative review.The data extracted is summarized in Table 1 below containing year of study, type of study,Populataion characteristics,Clinical Presentation of the patients, Ultrasonographic findings, required additional investigations apart from pelvic ultrasound to make diagnosis and definitive diagnosis.

DISCUSSION

Polycystic ovarian syndrome, an endocrine disease of unknown etiology, is becoming highly prevalent at present[16]. It is a triad of anovulation, hyperandrogenism and ultrasound features[17]. Pelvic imaging via ultrasonography in PCOS show bilaterally enlarged ovaries with multiple cysts and Doppler reveals increased vascularity owing to angiogenesis in ovarian stroma[18].The imaging findings are quiet similar to OHSS and HL[10,13,14]. This review was

proposed to compare the ultrasonographic features of PCOS, OHSS and HL. Owing to the occurrence of ascites, large size ovaries, multiple cysts, hyperechogenic ovarian stroma and increased doppler flow in all the three conditions, as revealed by our review, the diagnosis of each of the pathology could not be made solely on ultrasound findings and hence additional investigations to reach the final diagnosis are mandatory. Moreover, PCOS itself is a risk factor for OHSS, so a known PCOS patient may suffer from OHSS due to stimulated conception in her pregnancy where ultrasonographic imaging features may confuse the patient whether the enlarged multicystic ovaries and mild ascites are aggravation of PCOS or development of OHSS. This signifies the need for clinical and biochemical correlation of ulrasonographic findings in every patient prior to making a definitive diagnosis of PCOS, OHSS and HL.

Our review has a few limitations. Most of the studies in our review suggests the features of OHSS and only a few describes ultrasonographic findings of PCOS and HL. A great literature search with multiple keywords may result in further information in this regard. Moreover, the studies included in the review are case reports because of scarcity of literature focused on ultrasonographic findings of PCOS, OHSS and HL in available studies as perceived by the author.

CONCLUSION

Conclusively, pelvic ultrasonography aids in diagnosis of these pathologies rather than being the only diagnostic investigation. Supplementing imaging features with patients' clinical background and relevant lab investigations will help the gynaecologists to make a definitive diagnosis.

Conflict of interest: Nil

REFERENCES

1. Sheikh M. Role of Ultrasound in the Assessment of Female Infertility. Donald School Journal of Ultrasound in Obstetrics and Gynecology. 2014 Jun 1;8(2):184-200.
2. Fischer D, Reisenbüchler C, Rösner S, Haussmann J, Wimberger P, Goeckenjan M. Avoiding OHSS: controlled ovarian low-dose stimulation in women with PCOS. Geburtshilfe und Frauenheilkunde. 2016 Jun;76(06):718-26.
3. Ahmed AA, Moselhy SS, Kumosani TA, Huwait EA, Al-Ghamdi MA, Al-Madani KA, AlToukhi MH, Kumosani AT. Ultrasonographic and biochemical assessments as early prediction of polycystic ovarian syndrome in obese women. African Health Sciences. 2020 Jul 22;20(2):676-81.
4. Abdel Khalek Abdel Razek A, Abou Elatta H. Differentiation Between Phenotypes of Polycystic Ovarian Syndrome With Sonography. Journal of Diagnostic Medical Sonography. 2021 Apr 1:8756479321996676.
5. Morotti E, Battaglia C. Oligosypthomatic ovarian hyperstimulation syndrome in a spontaneous uneventful pregnancy. A case report. Gynecological Endocrinology. 2019 Feb 26.
6. e Souza LO, Arêas JV, Campos MC, Arêas II, Resende BA. Spontaneous ovarian hyperstimulation syndrome in a pregnant woman with hypothyroidism: a case report. F&S Reports. 2021 Dec 1;2(4):433-9.
7. Wang CW, Liu WM, Chen CH. Hyperreactio luteinalis mimicking malignancy during pregnancy with elevated CA-125. Taiwanese Journal of Obstetrics and Gynecology. 2019 Nov 1;58(6):885-7.
8. Celik S, Soyer-Calıskan C, Hatirnaz S, Celik H, Tosun M, Hatirnaz ES. Lifesaving dose increment of cabergoline in life-threatening spontaneous ovarian hyperstimulation syndrome resistant to all interventions. Gynecological Endocrinology. 2019 Apr 3;35(4):287-9.
9. Zhu RY, Wong YC, Yong EL. Sonographic evaluation of polycystic ovaries. Best Practice & Research Clinical Obstetrics & Gynaecology. 2016 Nov 1;37:25-37.
10. El-Agwany AS, Awad ES. Hyperreactio Luteinalis, A Great Imitator on Ultrasound: Is There a Relation with HELLP Syndrome?. Indian Journal of Gynecologic Oncology. 2016 Mar 1;14(1):14.
11. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, Shamseer L, Tetzlaff JM, Akl EA, Brennan SE, Chou R. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. Bmj. 2021 Mar 29;372.
12. Zhang FL, Fu LL, Yang Y. Both thromboembolic stroke and cerebral venous thrombosis resulting from Ovarian Hyperstimulation Syndrome (OHSS). J Obstet Gynaecol. 2016 Feb 17;36(2):267-8.
13. Osaikhuwuomwan JA, Osemwenkha AP. Ovarian hyperstimulation syndrome in a spontaneous pregnancy: A potential for missed-diagnosis. Nigerian medical journal: journal of the Nigeria Medical Association. 2016 Jan;57(1):74.
14. Rastin Z, Ghomian N, Khadem-Rezaiyan M. Severe ovarian hyperstimulation syndrome in a spontaneous pregnancy with normal singleton fetus: A case report. Iranian journal of nursing and midwifery research. 2019 Jul;24(4):310.
15. Dasari P, Nitin M, Thiyagarajan C. Hashimoto's Thyroiditis Presenting as Bilateral Ovarian Masses in an Adolescent. Journal of Scientific Research in Medical and Biological Sciences. 2021 May 26;2(2):81-5.
16. Belenkaia LV, Lazareva LM, Walker W, Lizneva DV, Suturina LV. Criteria, phenotypes and prevalence of polycystic ovary syndrome. Minerva ginecologica. 2019 Jun 1;71(3):211-23.
17. Alsadi B. Clinical Features of PCOS. In Polycystic Ovarian Syndrome 2019 Nov 25. IntechOpen.
18. Carmina E, Campagna AM, Fruzzetti F, Lobo RA. AMH measurement versus ovarian ultrasound in the diagnosis of polycystic ovary syndrome in different phenotypes. Endocrine Practice. 2016 Mar 1;22(3):287-93

Table 1: Summary of studies reviewed. (OHSS= Ovarian Hyperstimulation Syndrome, spOHSS= Spontaneous Ovarian Hyperstimulation Syndrome, PCOS: Polycystic Ovarian Syndrome)

Study & Year	Type of Study	Population Characteristics	Clinical Presentation	Ultrasound findings	Additional Investigations required	Diagnosis
[12] 2016	Case Report	23 year old , Pregnant,Known case of PCOS,Ovulation induction by GnRH	Sudden left hemiplegia Dysarthria	Bilateral Large Multicystic ovaries Right = 137×94 mm Left = 115×75 mm Massive Ascites	D-dimer =1047ug/L,F, Fibrinogen = 4.9 g/L, WBC = 221900/ml, HCT = 43.20%. S.Albumin = 26.2 g/L,, hCG = 133 IU/L, MRI multiple cerebral thrombosis Hyponatraemia, Hypochloraemia Hypocalcaemia.	OHSS leading to CVT
[13] 2016	Case report	32 yr old G1P1 Spontaneous conception	Lower abdominal pain and dyspnea	Bilateral Large Multicystic ovaries(Right : 75×53 mm) (Left ovary 60×42 mm) Massive Ascites Large ovaries	CBC : Normal,HCT: 38.8%,Serum Protein: 80g/L Serum ALT: 18u/l ,Serum AST: 19u/l CRP: 0.11 mg/dl, Serum. Ca-125 Ag : 26.2 u/ml	spOHSS
[14] 2019	Case Report	28 yr old G1P0 Spontaneous conception	Severe generalized abdominal pain and distention	Bilateral Large Multicystic ovaries(Right : 124×85 mm) (Left ovary 120mm×110 mm) Massive Ascites Large ovaries	HCT: 48%, Leukocyte:14000/mL,hCG :96103 U/L,RFTs,BUN,Serum electrolyte, estradiol, FSH ,TFTs normal, CA- 125: 86 U/mL CA15- 3, CA19- 9, CEA) normal.	OHSS
[8] 2018	Case Report	25-year-old Nulliparous Spontaneous pregnancy	Mild abdominal pain Bilateral ovarian enlargement	Bilateral Large Multicystic ovaries(Right : 13×9 mm) (Left ovary 11 mm) Massive Ascites Large ovaries	Leukocyte: 14790/ mm3,Hb 12.2 g/dL, HCT 36.7%;,Platelet : 223 000/mm3 Coagulation ,LFTs,RFTs,TFTs, electrolytes, ,albumin,Urinalysis normal.	spOHSS
[9] 2016	Narrative review	----------	----------	Large Multicystic ovaries Increased stromal blood flow	LH, FSH, Testosterone, Androgen	PCOS
[10] 2016	Case Report	A 30-yearold Multigravida,Spontaneous conception	lower abdominal pain.	Bilateral enlarged Multicystic ovaries Right = 18 cm, Left = 15 cm Ascites	CBC,RFTS,LFTs, CA-125 Normal b-HCG = 301,440 IU/L Urine Sterile on Culture	Hyperreactio\ luteinalis
[15] 2021	Case Report	18 years old adolescent unmarried girl Hypothyroidism	pain abdomen and vomiting	Increased ovarian size, Multicystic ovaries Right 7x6.8x3.5 cms, Left 10x6.8 x3.2 cms Minimal ascites in pelvis Doppler normal,	Beta HCG-0.3 mIU/ml,AFP-25ng/ml CA 125 -25.5 IU/ml,CEA- 1.7 ng/ml; LDH-480 U/L,Hb-6.2 gms%; BSR:87 mg% WBC-8,440/mm3, Platelets -3.68 lakhs/mm3 Normal RFTs,LFTs,S.elecrolytes, LH,FSH,Testosterone,Serum Albumin -4.9gm/dl,***TSH - 483***; T3 1.94; T4 0.32 **Anti-TPOAb - >1300;** S. Prolactin- 38.9 ng/ml S. USG Thyroid: Few benign appearing nodes largest 5mm	HSS due to Hashimotos thyroiditis
[5] 2019	Case Report	30-year-old Nulliparous, Spontaneous pregnancy	Enlarged ovaries.	Increased ovarian size Right ovary=10.2×9.0×6.2 cm Left ovary =12.7×7.0×10.4cm multiple thin-walled cysts Doppler normal	CBC,coagulation profile, TFTs , LFTs,RFTs,Serum electrolytes,Total protein normal.,Hb: 10.8 g/dL,HCT 31.8%). Ddimer 1.08 mg/L ,Estradiol (17 015 pg/mL Testosterone=1.45 ng/mL Androstenedione 737 ng/mL ,b-hCG 185,425 UI/L	spOHSS
[6] 2021	Case report	32-year-old, primigravida Known case of hypothyroidism Spontaneous pregnancy	Constipation, Drowsiness, Excessive use of iron supplements	Increased ovarian size Right : 9.3 × 6.3× 5.9 cm Left : 10.6×10×7.1 cm, Multiple cysts containing anechoic content	TSH=100 mU/L Free T4=0.25 ng/dl Hb= 6.7 g/dl, Normal WBCs,PLTs,RFTs,CEA CA-125=56 U/ml (Increased)	spOHSS