

SYSTEMIC REVIEW

Comparison of Ultrasonography with other Imaging Modalities for Detection of Adnexal Torsion: A Systematic Review

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ABSTRACT

Background: Adnexal Torsion (AT), serious emergency of gynecology, frequently shows among nonspecific signs prominent to late analysis.

Aim: To compare the test accuracy of Ultrasound, Computed Tomography (CT) and Magnetic Resonance Imaging (MRI) for diagnosis of adnexal torsion.

Methodology: We observed google scholar as well as Radiographics key till Dec 2019. Assortment standards studies report upon Imaging Modality accuracy (index test) within paediatric and adult females alleged of adnexal torsion matched by clinical analysis or usual clinical or radiological follow up duration till symptoms firmness (reference standard).

Results: We mark off 3836 references, comprised 18 Studies (1654 females, 665-cases), as well as comprised 15 into meta analyses, ultrasound pooled-sensitivity ($n=12$, 1187 females) was 0.79 (95% CI= 0.63 to 0.92) as well as specificity was 0.76 (95% CI= 0.54 to 0.93), by means of positive as well as negative probability fractions 4.35 (95% CI= 2.03 to 9.32) and 0.29 (95% CI= 0.13 to 0.66), correspondingly. By Doppler Ultrasound ($n=7$, 845 females) produced alike and specificity (0.88, 95% CI= 0.72 to 1.00) and sensitivity (0.80, 95% CI= 0.67 to 0.93). For magnetic resonance imaging ($n=3$, 99 females), pooled-sensitivity was 0.81 (95% CI=0.63 to 0.91) as well as specificity was 0.91 (95% CI= 0.80 to 0.96). Meta-analysis for Computed Tomography was impossible by 2 case control-studies as well as one cohort-study ($n=3$, 232 females). Its range of sensitivity was 0.74 to 0.95 as well as specificity 0.80 to 0.90.

Conclusions: As a first line analytic examination for alleged AT, ultrasound has good performance. Increment in quantity of AT cases needs precise, rapid, as well as correct analytic extent. It has been utmost popular method as allied with further Imaging Modalities. MRI might compromise better specificity for investigating intricate morphology of ovary, nonetheless further proof is wanted. Beside with medical doubt as well as approximations. This study will offer sufficient appreciated evidence to understand sonographic markers impact during OT analysis precisely.

Keywords: Adnexa, Computed Tomography, Doppler, Magnetic Resonance Imaging, Meta-analysis, Ovary, Test Accuracy,

INTRODUCTION

AT is a grave emergency of gynecology that comprises incomplete or else whole twist of infundibulo-pelvic-vascular pedicle. It intensely concessions vascular supply of ovaries as well as assistant Fallopian Tube provoking ischemia, tissue-necrosis, condensed Ovarian Follicular spare, sub-fertility as well as initial menopause.¹ Utmost precious females existent by non-specific indications like vomiting, fever and abdominal pain foremost for deferred analysis as well as augmented threat of emergency Oophorectomy. By way of such, founding quick analysis is main for enabling initial surgical-untwisting as well as renovation of cooperated Vascular Supply. To assistance it's analysis, many Imaging Modalities have been utilized as well as assessed within works.⁴ For evaluating the pathology of ovaries, ultrasound is commonly used due to safety, obtainability as well as affordability.³ Though, numerous influences might frontier it's correctness for diagnosis of adnexal torsion like experience of operators, quality of machine, complex ovarian morphology presence and pregnancy.⁴ For highlighting cooperated vascular-supply to adnexa, Doppler is frequently utilized. Both CT as well as MRI have been utilized for evaluating composite morphology of ovaries though, their usage for diagnosis of adnexal torsion might be vulnerable through differences in analytic standards as well as practice of evaluator^{4,5}.

Examination correctness intended for these Modalities is exactly unknown, therefore cumulative differences in repetition as well as delaying actual policy making^{6,7}. Meant of appraisal for comparing examination precisions of numerous Imaging Modalities utilized to analyze AT through leading a Systematic Review as well as Meta-analysis.

Fig. 1: Gray scale imaging Characteristic appearance of the whirlpool sign on gray-scale imaging, showing a twisted pedicle in a plane perpendicular to the axis of rotation. By turning the transducer 90° the whirlpool sign is imaged in cross-section



Fig 2: The characteristic spiral whirlpool sign is emphasized using color Doppler imaging



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MATERIAL AND METHOD

We led a Systematic Review by a recognized procedure for test-accuracy study as well as a prospectively listed etiquette. We stated results of our appraisal in place of per-established guidelines.

Research Strategy: The search was conducted in accordance with the principles of Systematic Reviews. The searched databases were: **Google scholar (2000-2020) and Radiographics Key (2000-2020):** The key terms searched were adnexa, CT, Doppler, MRI, Meta-analysis, Ovary, Test Accuracy, Torsion, and Ultrasound. Using these key terms, researchers found total 30 studies from the above-mentioned data bases. Among these researchers found 12 studies from Google scholars and 18 from Radiographics Key. After this, researchers separated the relevant and irrelevant data, while 10 relevant and open access studies were extracted, from the searched data.

Inclusion / Exclusion Criteria and Study Design Selection: The selection criteria include those studies that include patient with sever lower abdomen pain. All irrelevant studies to our research title, randomized control/clinical trials (RCTs), and non-matched retrospective & prospective studies and chart reviews were excluded because of their biased results. All relevant observational (cross-sectional) studies were included.

RESULTS

We recognized 3836 possibly pertinent references; of these, 124 were studied into filled alongside our enclosure standards as well as 18 were comprised commentary upon 1654 females. Furthermost revisions (83%, 15/18) were associates (14 displays as well as 1 eventual) nonetheless 3 were reflective case control (17%, 3/18), 1 reporting upon Computed Tomography, 1 upon Ultrasound, as well as 1 upon Ultrasound as well as Computed Tomography. Median sample-size was 71 (range: 29 to 323)-among 665 definite cases of adnexal torsion (40%, 665/1654). There were 4 studies from USA (22%, 4/18), 4 from Israel (22%, 4/18), 3 from Korea (17%, 3/18), 2 from France (11%, 2/18) as well as 1 from each one of Iran, India, Canada, China as well as Saudi-Arabia. 2/3 study utilized operating examination by way of reference standard (67%, 12/18), though 6 utilized combination of surgical-exploration as well as clinical follow-up (33%, 6/18). 3 studies stated upon each one of CT 9, 12, 13 as well as MRI 14 to 16 (17%, 3/18). 14-studies stated upon ultrasound accurateness (44%, 14/18), in which 9 comprised Doppler usage (64%, 9/14) as well as 5 comprised solitary adults (36%, 5/14) while residual comprised combination of adults and paediatric patients or didn't state upon age. 10 ultrasound-studies solitary utilized surgical-exploration by way of reference examination (71%, 10/14) while residual 4 utilized combination of Surgical as well as Clinical follow-up. Study was started after permission from IRB.

Test accuracy meta-analysis: Pooled specificity and sensitivity for Ultrasound (12-studies, 1187 females) 16 to 27 were 0.76 (CI 0.54 to 0.93, 95%) and 0.79 (CI 0.63 to 0.92, 95%) among positive and negative ratios 4.35 (CI 2.03 to 9.32, 95%) as well as 0.29 (CI 0.13 to 0.66, 95%) correspondingly. Visual-inspection of heterogeneity presented larger capriciousness in Sensitivity than Specificity processes. We assessed further usage of Doppler by Ultrasound in Meta-regression (7 studies, 845 females) 18 to 20, 22 to 24, 26 which presented small developments within Sensitivity (0.80, CI 0.67 to 0.93, 95%) as well as Specificity (0.88, CI 0.72 to 1.00, 95%), however not-statistically important. We likewise lead sub-group examines by Surgical Exploration solitary by means of reference examination (n=9, Sensitivity 0.81, CI 0.61 to 0.94, 95%), Specificity 0.73, CI 0.42 to 0.94, 95%) 18 to 24, 26, 27 as well as in those reportage upon Adults solitary (n=3, Sensitivity 0.84, CI 0.34 to 0.98, 95%, Specificity 0.78, CI 0.42 to 0.94, 95%).19, 20, 27. Mutually sub-groups presented alike approximations to entire people. Test-accuracy Meta-analysis for Magnetic Resonance Imaging (3 studies, 99 females) 14 to 16

presented joint Sensitivity of 0.81 (CI 0.63 to 0.91, 95%) as well as Specificity of 0.91 (CI 0.80 to 0.96, 95%). Among 2 case control revisions as well as 1 cohort-study (n=3, 232 females), Meta-analysis for Computed Tomography was impossible. It had stated Sensitivity Ranging from 0.74-0.95, as well as Specificity from 0.80-0.90.

DISCUSSION

AT comprises ovary torsion tube or both and assessed to be accountable intended for a minor amount of entire gynecological crises, nonetheless is a usual task of setting of emergency. Its analysis is problematic as well as mostly on the basis of clinical symptoms, imaging modalities as well as analysis results. It mostly affects reproductive age group of females.⁸ Though, it may be perceived into pre-pubertal teen-agers as well as post-menopausal females. Casey RK et. al., 2013 look after reflective study for reviewing 15 cases of inaccessible Fallopian Tube torsion into pediatric age, wherein earliest youngster of 8 years old was identified with Fallopian Tube torsion. Djing et. al., 2007, reported female of 70 years old was analyzed with torsion of Fallopian Tube. Now, we have perceived torsion of Fallopian Tube in pre-menarchal girl of 9 years old, girls of 13 years old has accomplished her menarche as well as unmarried of 20 years old. Though, Philips et. al., 2009, females with chronic lower-abdominal pain was found for having isolated torsion of tube of right side. Upon clinical analysis, sensitivity of abdomen is frequently discovered with/without peritoneal emblems. Findings of laboratory are frequently usual, as gotten within our patients too^{9,10,11,12}.

Ultrasound is frequently main Imaging Modality done for acute abdominal pain. Sonographic results are of IFTT remain widened tube with thick echogenic-walls, normal appearing uterus as well as ovary with normal flow of blood and free-fluid Douglas pouch¹³.

Vijaya Raghavan SB et al discussed sonographic whirl-pool emblem by way of precise emblem of Fallopian Tube Torsion and defined by way of whirlpool mass occurrence in adjacent nearness to Fallopian Tube, this mass is frequently not for instance big/obvious associated through which gotten in OT, later disturbing endo-vaginal probe movement is made over this area. Though, this symbol is problematic for eliciting within utmost patients^{14,15}.

OT is 5th utmost usual problematic demanding emergency operation. If remains un-diagnosed, supply of blood turn out to be cooperated ensuing in necrosis of tissues as well as therefore function of ovary is loss. OT is utmost often perceived in early females with 20-30 years old¹⁶.

White M et. al., 2005 accompanied 52 cases of surgically verified OT with 33.5 years mean age and inter-quartile range was 28.7-39.3 years. Likewise, Sahlu Z et. al., 2014 reported 53 cases of adnexal torsion, mostly females were of 20 to 29 years old. Matthew F Ryan et. al., 2012 reported OT case in 5 years old child^{17,18}.

Naveen Poonai et al., 2013 discussed 21 did reflective appraisal of OT within paediatric people and examined 13 cases as well as discovered child of 7 months as newest OT case. Range of age was 7 months-18 years with mean age of 12 years as well as maximum cases were moreover with age group of menarchal or peri-menarchal. Peng YY et. al., 2008 stated torsion case of enormous ovarian-cyst of female of 90 years old¹⁹.

Cross-sectional study through Zohreh Yousefi et al completed in 2015, OT occurrence within 22.6% post-menopausal females of mean age as 59± 5.8 years. At this point, we have stated OT demonstration of numerous groups of age, fluctuating from nine years, eighteen years as well as to 82 years old female²⁰.

Torsion frequently happens uni-laterally with 70% cases right sided cases. Reasons intended for extra usual incidence of right-sided are lengthier ligament utero ovarian upon right side as well as inadequate gap upon left side because of colon of sigmoid presence²¹.

Yaakov Melcer et. al., 2015 out of 199 patients 25 discovered in their study, 62.5% females had torsion of right side, 36.5% had torsion of left side as well as 1% had bilateral participation. Likewise, in 2016, Haifa A. Al Turki in 2016, 63.6% children had torsion of right side and 36.4% had torsion of left side. OT is typically related by medically distended adnexa. Rousseau V et. al., 2008, discussed OT in 40 children. <16 years old were 38 cases though 2 were neonates. All patients were undertaken by ultrasound, that exhibited 29 patients (72.5%) had ovarian-mass, among which 14 had teratoma, 10 had cyst-adenoma, 2 had functional cyst, 1 had synchronous mature teratoma and 2 had malignant neoplasm with carcinoma ovary^{22,23,24}.

Spinelli et. al., 2013 discussed OT organization in adolescents and children and discovered the cases of fundamental pathology were 76.7%, in which purposeful Ovarian Lesion cases were 56.7% as well as cases of Benign Neoplasm were 20% though cases of OT with normal adnexa were 23.3%^{25,26}. Three cases of ovarian cyst pre-operatively were found in our study, also there was history of poly-cystic ovaries within unmarried girl of 18 years old.

CONCLUSION

As a first line analytic examination for alleged AT, ultrasound has good performance. Increment in quantity of AT cases needs precise, rapid, as well as correct analytic extent. It has been utmost popular method as allied with further Imaging Modalities. MRI might compromise better specificity for investigating intricate morphology of ovary, nonetheless further proof is wanted. Beside with medical doubt as well as approximations. This study will offer sufficient appreciated evidence to understand sonographic markers impact during OT analysis precisely.

Conflict of interest: There is no conflict of interest.

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