AHMEDABAD OBSTETRICS & GYNAECOLOGICAL SOCIETY

AOGS TIMES

॥ज्ञानम्॥

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Motto : Knowledge is Power - Unity is Strength
Theme : Health & Happiness for Her

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TEAM AOGS MESSAGE

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As the calendar turns to a fresh page, we find ourselves at the dawn of a new year, brimming with possibilities, hope, and the promise of growth. The New Year is a symbolic moment, a reminder that every end carries the seed of a new beginning. It is a time to reflect on the lessons of the past, celebrate the victories—big and small—and chart a course for the future with renewed determination.

Reflecting on the Year Gone By

The past year was a tapestry of experiences, woven together with moments of triumph, resilience, and learning. While challenges tested our resolve, they also highlighted our strength and ability to adapt. Communities united, individuals rose to new heights, and humanity continued its relentless pursuit of progress. Let us take a moment to honor those experiences, for they have shaped us into who we are today.

Setting the Tone for 2025

The New Year is more than just a change in date—it's an invitation to dream, to grow, and to make meaningful changes. Whether your goals include personal development, professional achievements, or making a positive impact on the world around you, this is the perfect time to start. Small, consistent steps toward a brighter future can lead to remarkable transformations.

Embracing Unity and Hope

In a world that often feels divided, the New Year is a universal moment that binds us together in shared hope. It reminds us of the importance of kindness, collaboration, and compassion. As we move forward, let's resolve to lift each other up, foster understanding, and work together to build a more inclusive and sustainable world.

Looking Ahead

The horizon of 2025 is aglow with opportunities waiting to be seized. From technological innovations and cultural milestones to environmental initiatives and personal breakthroughs, the possibilities are endless. Let us step into this New Year with courage, optimism, and a firm belief that the best is yet to come.

Here's to a year filled with new beginnings, cherished moments, and boundless potential. Happy New Year!

Artificial Intelligence in Obstetrics and Gynecology

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Introduction

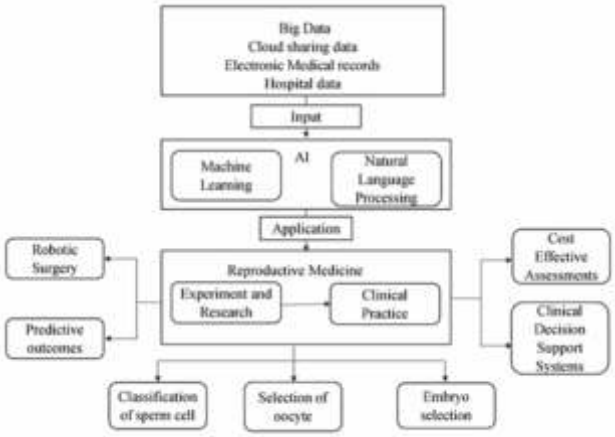
Artificial Intelligence is an incoming thing, and keeping up with advancing technology is the need of the hour. AI can be divided into three types; namely Artificial Narrow Intelligence, where the tasks done are of below the level of human brain, Artificial General Intelligence where the tasks are of the level of human brain, Artificial Super Intelligence where tasks exceed human brain.

Machine learning is a simple form of AI, which can be further divided into supervised, unsupervised and reinforcement learning. Below is the table denoting characteristics of machine learning and deep learning.

Table 1: Machine Learning vs Deep Learning *(Seval, 2023)*

Machine learning	Deep learning
A subfield of artificial intelligence	A subfield of machine learning
Considerable human intervention is needed to correct and learn	Learns by itself from experiences and prior failures
Able to learn with less data sets	Need a significant quantity of data
Shorter training time and lesser accuracy	Longer training and higher accuracy
Establishes basic, linear relationships	Generates complex, non-linear relationships

Table 2: Role of AI in Reproductive Medicine *(Malani S, 2023)*



AI applications in healthcare include computer aided fetal evaluators (CAFÉ), cardiotocography (CTG) etc. Determination of diagnosis, prognosis, therapy, optimization and drug discovery become accurate with AI.

Obstetrics:

First Trimester:

Development of texture feature extractor module is being developed which could estimate adverse pregnancy outcomes before beginning of clinical manifestations of the disease. *(Murillo, 2020)* The module is based on variations in texture of placenta in patients with HDP (Hypertensive disorder of pregnancy) and normal pregnancy.

CTG:

CTG was developed in 1980. Intra-partum fetal monitoring *(Broklehurst, 2016)*with AI has many advantages. Hypoxia induced Encephalopathy and rising litigations have made it mandatory to have a system for accurate and earlier detection of fetal compromise. (Vickers, 2019) 50% reduction in neonatal seizures was noted with use of continuous CTG. Regular observations is key to early detection and intervention for abnormal CTG.

AI is superior to humans as it doesn't have human limitations like fatigue, distraction, bias, poor

communication, cognitive overload or fear of doing harm. Inter and Intra observer variations might affect interpretations even with usage of AI. Qualitative and quantitative overview of baseline FHR, acceleration, variability, deceleration, uterine contraction, changes in FHR pattern are obtained with usage of AI. Computerized Interpretation of Fetal Heart Rate During Labour (INFANT) study protocol is a large trial analyzing ability of AI interpretation of CTG during labour to make FHR reading more reliable, to help in decision making, to make the system more efficient. It improves care and outcome. *(Brocklehurst, 2016)* System 8000 is a computer system analyzing FHR, it monitors FHR changes and detects amplitude associated with hypoxia by diagnosing decelerations and changes in variability.

AI technology is being developed for home monitoring in high risk patients. Availability of internet at homes has made it possible to have tracing transmitted to the remote receivers, making telemedicine a boon for the health care. AI inserted into Doppler USG has found to be cost-effective, major advantage being exclusion of uncertain meaning of pseudo acceleration or pseudo deceleration happening due to intense fetal movements.

USG:

Human limitations are there with USG in cases of maternal obesity, motion blurring, missing boundaries, acoustic shadows, speckle noise and low signal to noise ratio. *(Benacerraf, 2018)*

Manual imaging is slow and not error free, thus new technology using AI can be of great advantage. Currently existing program is the one which is semi-automated for fetal USG analysis, automatically performing body measurement using AI algorithm after sonographer selects an appropriate image of each body part. *(Ambroise, 2018)* To obtain high quality images within an appropriate amount of time, training is required. Free hand USG plane acquisition has been developed, but not yet standardized. Probe guidance system provided useful navigation signal towards targets such as standard plan of certain structures. *(Droste, 2020)*

Figure 1: Automatic Calculation of Amniotic Fluid (Ho, 2023)

Fetal Echocardiography:

Essential for perinatal care, diagnosing IUGR, TTTS and congenital heart anomalies. Human limitations are encountered when there are faster fetal heart beats, small fetal heart and fetal movements and limited access to fetus and lack of expertise. Automatic calculation of fetal heart rate is possible with usage of AI. Congenital heart anomalies are detected with an intelligent navigation method referred to as FINE (Fetal Intelligent Navigation Echocardiography) (Yeo, 2013) Limitations are still encountered with accurate plane and clinical decision making with usage of AI at present.

MRI:

Routinely, MRI is called for to discriminate fetal brain anomalies and placenta previa grading. Prediction of necessity of neurosurgery was made with usage of AI, in fetal brain anomalies. (Eisapia, 2018) Placental

thickness and placental adhesions were diagnosed with much more accuracy and higher sensitivity and specificity. (Sun, 2019)

Preterm Labour:

Combination of AI and amniotic fluid proteomics and metabolomics, along with demographic, clinical and imaging factors were used to predict perinatal outcomes in asymptomatic women with short cervix. (Bahado-Singh, 2019) Electrohysterography signal along with 3 machine learning algorithms were used to identify true labour and to detect preterm labour accurately. (Ibrahim, 2015)

Figure 2: Maternal Fetal Medicine and AI *(Kannaiyan, 2024)*

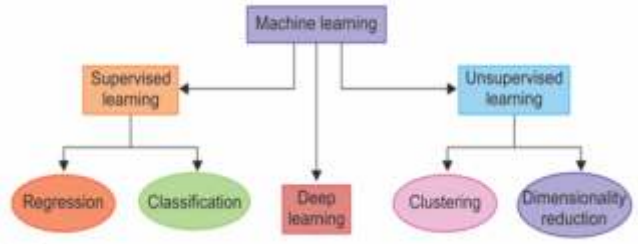


Figure 3: Maternal-Fetal Monitoring and AI *(Kannaiyan, 2024)*

Gestational Diabetes Mellitus:

AI calculator has been developed to make screening of GDM more convenient and more cost-effective. The calculator is made available online, for doctor as well as patients. Risk factors such as hypertension, hyperlipidemia, smoking, weight, low fat diet and ethnicity were used to create the calculator.

Others:

Estimation of Gestational age, Aneuploidy, asymptomatic short cervical length and fetal brain anomaly have been investigated using Machine Learning algorithm. *(Ho, 2023)* System for measurement of AFI with usage of AI is being developed, which can optimally direct for further management. Nuchal Translucency and such features are being studied for development of program based on AI.

The future is a probe which when placed on mother's abdomen will not only measure the parameters, but also will diagnose the conditions as well as direct the treatment plan.

Postpartum Period:

Gene array profiling of myometrial events during guinea pig pregnancy was studied for better understanding of molecular mechanisms regulating labour. *(Mason, 2006)* MetaCore program is a novel one, which can aid with task of understanding how gene expression in myometrium is programmed.

Gynecology:

IVF:

Data Mining (DM) is a technique for uncovering patterns in large databases that combines AI and advanced statistics. DM obtains needed data and is capable of finding other important factors influencing outcome. Combining AI and ANNs (Artificial Neural Networks) to extract texture described from oocyte or embryo images, with this method, most viable oocytes/embryos can be identified; which have high chances of pregnancy. AI is used to assess patients' characteristics such as ovarian reserve, endocrine status, diagnostic test and age enhancing effectiveness of treatment. *(Yin, 2022)* These parameters assist in likelihood of pregnancy after IVF. Attempts have been made to assess human oocytes, predict normal fertilization, analyze embryo development to blastocyst stage. AI can be used to assess implantation potential through static oocyte images in pre and post pregnancy periods. *(Yin, 2022)*

Ovarian Cancer:

Prognosis for Ovarian cancer is difficult at times even in hands of experts. Prediction of most useful treatment modality is possible with AI. Volume of RNA data to build models capable of diagnosing early ovarian cancer. *(Enshaei, 2015)*AI Neural network could keep up with intricate linkages between micro RNA, accurately recognizing 100% of anomalies associated with ovarian cancer, as compared to USG screening which diagnoses abnormal results in<5% of the cases. *(Kann, 2019)*AIOutperformed humans in detecting pre-cancer images of cervical region. It studies large amount of images to learn detection with accuracy.Minimum training is required with optimal results. *(Hu, 2019)*

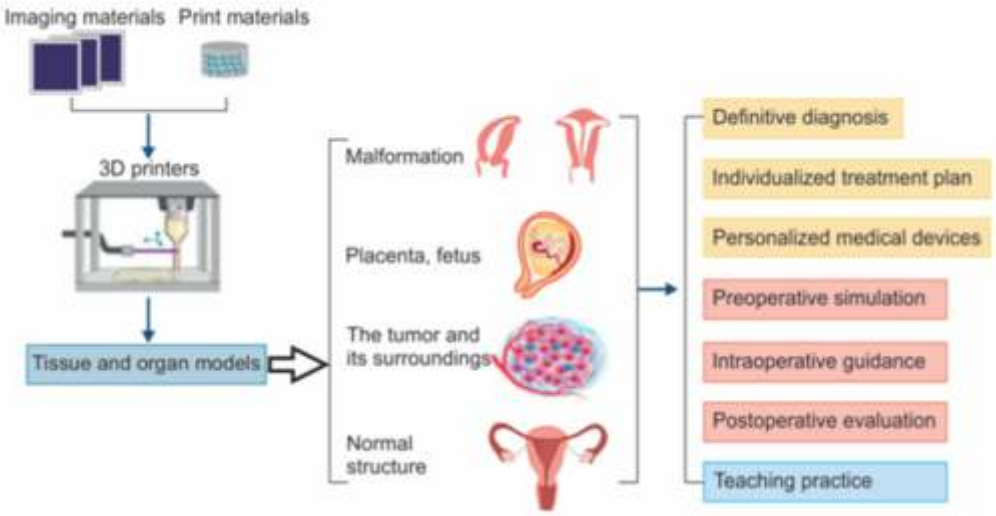
Patients at risk of more aggressive tumors can be identified with AI system, by scanning ovarian cancer cells. It identifies irregularly shaped nuclei correlating with tumor aggressiveness. *(Enshaei A, 2015)* Routine biopsies can be scanned by AI for identifying risk factors related to DNA instability and therapy can be chosen accordingly. IBM's Watson for Oncology uses AI in conjunction with patient data guiding cancer management, which has proven efficient for breast cancer patients. *(Moawad, 2019)*.

Gynec Surgery:

Physical AI vs Virtual AI: Physical AI is superior for studying surgical fields. Consistency of different tissues, surgical skill, changes of surgical fields, mobility of tissue are the factors playing key role. *(Moawad, 2019)*Imaging and spatial awareness is better with AI. AI can aid surgeon by enhancing imaging before and during surgery. 3D printing mimicking operation site is far better than 2D printing, as it enables more exact pre-operative planning, realistic training practice and previously impossible pre-operative planning. *(Ajao, 2017)*Reduction of surgical time with precision, resulting in lesser complications is achieved. Augmented reality is used to achieve this, with real world items and digital enhancement resulting in more enhanced information.*(Dirie, 2018)*

Notifying surgeons about hidden vessels or structures, allowing them to be recognized quickly with protection; i.e. isolating ureters during gynec surgery, is possible with AI. Endoscopic system with AI was used to detect depth and position of ureter using algorithms, displaying greater accuracy and safety. *(Song, 2016)*

Figure 4: 3 D Printing for Gynec Surgery *(Kannaiyan, 2024)*



Robotic Surgery:

Robotic system for suturing or cutting tissue with high degree of precision and accuracy is being developed. Sensors with real time feedback to surgeon are being used, improving outcomes. Precise incisions, controlling bleeding and minimizing tissue damage are possible with this modality. Intra and Post operative diagnosis of complications can be made possible with development of algorithms, alerting the surgeon on time.

UroGynecology:

Telemedicine: Remote monitoring and tracking and regulation of patient's condition with wearable devices linked to AI systems is possible now. Electronic Medical Records software automates care-giver scheduling, organizes care plans, provides follow up alerts and automates payment. It offers patient and family portals. Virtual visits allow who reside far away, or have restricted mobility to receive follow up care without having a physical examination. Wearable devices like urine incontinence monitor, post-void residual bladder volume scanners could help in telemedicine. Wearable bladder volume monitors are developed for nocturnal enuresis in children and other incontinence. *(Van Leuteren, 2019)*

Pelvic Organ Prolapse:

Dynamic MRI are used in diagnosing and quantification of POP. Semi-automatic pelvic floor measurement method produced exceptionally consistent and exact placement. CT texture analysis of bladder wall could be useful tool for high-risk urodynamic features in patients with spina bifida. *(Khene, 2019)* Detection of Overactive bladder and Detrusor Overactivity can be diagnosed with more accuracy with usage of AI. *(Vang, 2021)*

A smart bracelet is developed for particular postures to identify the time and intervals between micturition. Voiding diary is gold standard and it makes patient to stay at home more often for noting things down.

Inclusion of symptoms and Quality of life scale in AI systems evaluating, diagnosing and follow up progress after treatment can promisingly predict benefit of surgical procedures inindividualized cases.

Endometriosis and Fibroid:

Computer aided diagnostic systems can assist for endometriosis. ML Algorithms are used to analyze images of pelvic region and locate endometriotic tissue. ML algorithm can also be used to analyze imaging data, predict growth and behavior of fibroid which can aid in development of personalized treatment plan.

Challenges:

Quantity and quality of data used to generate models can affect the robustness of the database. Medical software, electronic medical records, care platforms, ambulatory devices, patient parameters, surveys and measures of patients related outcomes should all be developed in collaboration.

Ethical means for archiving surgical and peri-operative data must be devised.

Applicability: Non-mentioned clinical data might be skipped if not included in training segment of that AI model.

Professional liability for doctors using AI

Lack of data

Bias in data

Limited interpretability

Inability to handle uncertainty

Ethical Concerns

Conclusion:

AI is a smart tool, which can abolish human errors and brings accuracy, thereby giving optimal outcome for diagnosis and management of many of the medical conditions. Learning to use these technological advances is must for every clinician, to be at peace by delivering the best possible to the patients.

AI is a tool or a helper for humans, not a replacement…

Artificial Intelligence(AI) in Robotic Surgery for Gynecologic Cancers

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Robotic surgery is transforming gynecologic oncology by offering innovative, minimally invasive solutions that enhance surgical precision and reduce patient recovery times. With the integration of Artificial Intelligence (AI), robotic systems are advancing further, setting new benchmarks in accuracy, efficiency, and accessibility.

The Impact of Robotic Surgery in Gynecologic Oncology

Robotic surgery, powered by systems like the da Vinci Surgical System, has become a game-changer in treating gynecologic cancers, including endometrial, ovarian, and cervical cancers. These advanced robotic platforms provide unparalleled dexterity, tremor elimination, and high-definition visualization, enabling surgeons to perform complex procedures with smaller incisions.

For patients, this means less pain, reduced blood loss, quicker recovery, and better overall outcomes. In gynecologic oncology, precision is critical for removing cancerous tissues while preserving surrounding healthy structures. Robotic surgery ensures these goals are met with enhanced accuracy.

How AI Enhances Robotic Surgery

AI integration is elevating robotic surgery to the next level, focusing on precision, automation, and decision support. Key advancements include:

1. **Real-Time Image Analysis**

   AI algorithms analyze surgical field images in real time, identifying vital structures such as blood vessels and tumors. This technology assists surgeons in precisely resecting tumors while minimizing harm to healthy tissues.

2. **Motion Optimization**

   By predicting and refining a surgeon's instrument movements, AI enhances the accuracy of delicate tasks like suturing and tissue resection, reducing errors and improving procedural efficiency.

3. **Haptic Feedback**

   AI-powered systems provide tactile feedback, allowing surgeons to feel the texture and resistance of tissues through the robotic interface. This innovation addresses the sensory limitations of traditional robotic systems and improves surgical outcomes.

Advantages of AI in Robotic Gynecologic Cancer Surgery

AI-driven robotic surgery offers numerous benefits for treating gynecologic cancers, including:

- **Superior Precision**

  AI helps ensure the complete removal of cancerous tissue while preserving healthy areas, improving

surgical outcomes.

- **Reduced Surgeon Fatigue**

  By automating repetitive tasks, AI allows surgeons to focus on the most critical aspects of the procedure, improving efficiency and consistency.

- **Improved Accessibility**

  AI-enabled teleoperated robotic systems can bring specialized surgical expertise to remote or underserved areas, democratizing access to advanced treatments.

Challenges in Adopting AI in Robotic Surgery

While AI in robotic surgery holds immense potential, its widespread adoption faces several challenges:

1. **High Costs**

   The development, acquisition, and maintenance of AI-powered robotic systems are expensive, limiting their availability, especially in low-resource healthcare settings.

2. **Data Quality and Bias**

   AI algorithms depend heavily on high-quality, diverse datasets for training. Poor data or biases can lead to inaccurate predictions and exacerbate healthcare disparities.

3. **Ethical and Legal Concerns**

   As AI systems become more autonomous, questions about liability and accountability in the event of complications or errors arise. Regulatory frameworks must address these concerns effectively.

The Future of AI in Robotic Gynecologic Surgery

The future of robotic surgery in gynecologic oncology is bright, with promising developments on the horizon:

- **Greater Autonomy**

  Advancements in AI may enable robots to perform complex tasks with minimal human intervention, paving the way for increased surgical efficiency.

- **Personalized Treatment Plans**

  AI can analyze patient-specific data, including medical history and genetic profiles, to develop tailored surgical approaches that optimize outcomes.

- **Enhanced Training for Surgeons**

  AI-driven simulations and virtual reality platforms are revolutionizing surgical training, providing realistic environments for practicing intricate procedures.

A New Era in Gynecologic Oncology

The integration of AI into robotic surgery is redefining the standard of care in gynecologic oncology. By improving precision, reducing complications, and expanding access to specialized care, AI-driven robotic systems are transforming patient outcomes. As research continues and technology evolves, these advancements will further strengthen the role of robotic surgery in the fight against gynecologic cancers.

Introduction stages, clinical features and Diagnostic methods for Endometriosis

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INTRODUCTION :
Endometriosis is the migration of the endometrium from the normal uterine cavity to other sites, in uterus and even outsides the uterus .Normally endometrium is the innner lining of the uterine cavity. Most commonly it is seen in ovary as ovarian endometrioma or chocolate cyst and fallopian tubes causing tubo-ovarian mass .locally to the myometrium of the uterus called as adenomyosis.
Cervix, Vagina , broadligament, uterosacral ligament, rectum , bowel, abdominal scar .are other sites .Distant metastasis is also seen in eyes and brain which are rare. Most commonly seen in the reproductive age group females with the incidence of 10-20 % and more commonly encountered in infertility patients and patients with chronic pelvic pain.

Classification :
Revised ASRM Classification
The classification/staging depends on scores of endometriotic patches and adhesions and the size of the lesions .
Stage 1 Early stage with minimal involvement.
Score: 1-5 with superficial endometriotic patches seen over peritoneum and ovary may be one or both ovaries with flimsy adhesion .
Stage 2 (mild):
Score: 6-15 stage 1 plus deep endometriotic patch in one or both the ovaries with flimsy adhesions.
Stage 3 (moderate):
Score: 16-40 with deep endometriotic patches in the peritoneum, ovarian endometrioma and dense adhesions of fallopian tubes with partial posterior cul-du-sac involvement.
Stage 4 (severe):
Score: >40 Many deep endometriotic patches in the peritoneum, large or multiple chocolate cysts, many dense adhesions and complete cul-de-sac involments.
Others conditions like distant metastasis in bowel , bladder , vagina , cervix and other uterine anomalies can be noted in others.
Limitations:
Though the r-ASRM classification system of endometriosis explains the condition in the peritoneum and ovaries, it fails to explain the involvement of retroperitoneal organs in case of deep infiltrating endometriosis (DIE). So to supplement the r-ASRM classification in the case of DIE with retroperitoneal involvement, ENZIAN system of classification was developed.

ENZIAN classification:
Score represented as, A0-3 B0-3 C0-3 FA, FB, FU, FO.
This system compartmentalizes retroperitoneal structures into:
Rectovaginal septum and vagina.
Sacrouterine ligament to pelvic wall.
Rectum and sigmoid colon.
and assigns scores from 0-3 analogous to TNM staging of malignant tumors based on size of lesions and in each compartment the lesion with the largest size is considered for scoring.
Lesions on other sites are noted as suffix to prefix F with F for foreign and suffixes being:
A for adenomyosis.
B for bladder.
U for ureter intrinsic involvement.
O for other(s).

Pathophysiology :-
Endometriosis is the disease or reproductive age group , there are many theories and hypothesis of its occurrence :-
It's difficult to say how endometrium is implanted to other place then normal uterine cavity.
Clinical Features :-
Dysmenorrhea :-
Pain during menses may aggregate due to endometriosis leading to severe cramps and long-standing painful menses , may be due to local invasion of the endometrium into the myometrium and causes pain during uterine contraction .
Dyspareunia:-
Again pain while intercouse , may be due to cervical motion tenderness, pouch of Douglass involvement, uterosacral involvement and also some time Vaginal involvement which can be very painful.
Dyachezia :-
Pain during defecation may be due to cul-de- sac involvement and rectal involvement , some time per rectal examination helps in diagnosis.
Chronic pelvic pain :-
Pain persisting even not relived but routine medication since long time , may lead to thinking of endometriosis.
Infertility :-
Infertility is commonly associated with endometriosis as both are interrelated , long-standing estrogenic environmental causes endometriosis and delays pregnancy may lead to endometriosis . Multiparity women have less incidence of endometriosis.
Ovarian cyst :-
Many persistent cyst with associated pain come out to be endometrioma .
Diagnostic methods :-
Always a proper history and examination is necessary for diagnosis followed by ultrasounds and MRI.
Above given symptoms are very common for endometriosis, if we found out any such history we should examine the patient and scans to be done to confirm it.
Pain again is the most common symptoms to suspect diagnosis of endometriosis.
A through history of pain , any other surgeries like lscs , history or PCOS , nulliparity may arise suspicion for endometriosis .
Examination plays a important role to rule out endometriosis:-
Per Abdomen examination in routine for all pain abdomen patients to rule out any previous surgical marks , any site specific tenderness , scar endometriosis can be ruled out over the caesarean scar , hard nodule like mass may be palpated with tenderness and pain during menstruation .
Per speculum examination in sexually active can be Carried out gently, seeing all the walls of Vaginal, vulva for any lesion, also pain on any specific site to be ruled out , cervix to be examined well any lesion or patch of seen .
Per Vaginal examination in sexually active female :- can feel any hard node or spot other than normal healthy tissue, Cervical motion tenderness is also a typical sign for endometriosis. Pain in the fornices needs to be evaluated, particular spot tenderness on biannual examination or movement of uterus to be seen. large ovarian cyst me be felt in the fornices.
Per-rectal examination to be done if one find out pain in the fornices to look out for tenderness and nodule over post uterine surface and post cup-de-sac.
All the above diagnosis needs to be confirm by transabdominal and transvaginal ultrasound .
Transvaginal is only carried out in sexually active female.
Transabdominal and transvaginal ultrasound :-
Again probe tenderness to be elicited , ovarian endometrioma can be ruled out , tubo-ovarian mass can be seen, hydrosalpinx can be seen , altered position of ovary may indicate adhesions. Altered endomyojunction indicated adenomyosis , grossly bulky uterus with altered thickening of anterior or posterior myometrium can be ruled out for adenomyoma or global enlarged uterus for global adenomyosis.
3D ultrasound image may helpful to see uterus tubes and ovaries in 3 dimension plane and tubo ovarian relation can be seen.
MRI :- May be need for deep sitting lesion and nodules which may be retroperitoneal and to rule out uterus, ovary and tubal anatomy in detail.
Diagnostic laproscopy:-
Diagnostic laproscopy now a days is considered gold standard to see uterus, tube and ovary in directly through telescope .Tubo-ovarian relation can be seen , peritoneum can be inspected properly and whole of the uterus , tube and ovary is well seen with scope and it's confirms diagnosis ans staging can be done, even therapeutic measures can be taken in the same sitting .

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