Strokovni prispevek/Professional article

2D/3D/4D ULTRAZVOK PRI OBRAVNAVI NEPLODNOSTI

2D/3D/4D ULTRASOUND IN INFERTILITY MANAGEMENT

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Izvleček

Izhodišča *Pri obravnavi vzrokov in zdravljenja neplodnosti postaja ultrazvok (UZ) vedno pomembnejši pripomoček. Razvoj ultrazvočnih naprav nam nudi vedno več informacij o fiziologiji in morfološki strukturi ginekoloških organov. Poleg običajnega 2D (dvodimenzionalni) pogleda na strukture, je možno s 3D (tridimenzionalno) tehniko pregledati celoten volumen v vseh ravninah (v sivi sliki, dopplerski prikaz, površinski, globinski) in 4D (štiridimenzionalni) prikaz, ki nam nudi 3D pogled v določenem času, torej 3D v živo.*

Vsebina *Pri obravnavi neplodnega para uporabljamo ultrazvok pri diagnostiki neplodnosti in sledenju zdravljenja neplodnosti.*

Ultrazvok pri diagnostiki neplodnosti: *Z ultrazvokom preiskujemo maternico, jajcevode, jajčnike in ugotavljamo trebušne vzroke neplodnosti.*

Pri diagnostiki lahko uporabljamo ultrazvok v proliferativni, periovulacijski in sekracijski fazi.

Pregled maternice: *Z 2D UZ pri maternici izmerimo velikost (dolžino, širino in debelino maternice) in 2D pretoke (barvni, pulzativni doppler). S 3D tehniko lahko natančno izračunamo volumen maternice s tehniko VOCAL (virtual organ computer-aided analysis) in 3D pretoke z indeksi pretokov (VI – vascular index, FI – flow index, VFI – vascular flow index) v njej. Do določene mere lahko z 2D UZ določimo razvojne nepravilnosti maternice, miome, adnenomiozo; pri določitvi teh sprememb ima 3D večjo diagnostično vrednost. Pri maternici posebej ocenjujemo endometrij. Z 2D UZ izmerimo debelino in ocenimo morfologijo in žariščne spremembe v endometriju (polipi, miomi, brazgotine). Z 3D tehniko točno določimo sagitalno ravnino za merjenje endometrija. Izmerimo volumen endometrija in drugih struktur, 3D pretoke v endometriju, subendometriju ali drugih strukturah. Pri pregledu endometrija si lahko pomagamo z instaliranjem tekočine v maternico – FIS (fluid installation sonography), uporabljamo lahko fiziološko raztopino ali gel. Strukturam v endometriju, ki so oblite s tekočino ali gelom, tako laže in bolj natančno izmerimo velikost in lego; lahko jih prikažemo s površinskim gledanjem, podobno kot pri histeroskopiji. S pomočjo dobljenih podatkov laže razložimo bolniku nepravilnosti in se laže odločamo za operativne posege.*

Pregled jajcevodov: *Jajcevodi so v 2D tehniki vidni le, če so razširjeni, vendar jih je težko ločiti od sosednjih struktur. S 3D UZ lahko določimo obliko in kontinuiteto razširjenega jajcevoda in ga gledamo iz več zornih kotov z obratnim prikazom (inversion mode). Za ugotavljanje prehodnosti jajcevodov lahko uporabljamo različna kontrastna sredstva. Uporabljamo lahko 2D tehniko (HyCoSy – Hysterosalpingo Contrast Sonography) ali 3D tehniko (3D-HyCoSy).*

Pregled jajčnikov: *Z 2D UZ merimo velikost in ocenjujemo morfologijo jajčnika. S 3D UZ izmerimo volumne jajčnikov, foliklov, cist ali tumorjev in 3D pretoke v posamezni strukturi. S 3D UZ točno določimo lego jajčnika glede na ostale strukture. Povšinski 3D prikaz nam omogoča pogled v notranjo površino ciste, folikla. Volumne tekočinskih struktur lahko merimo s tehniko VOCAL ali SonoAVC (sono automated volume count). Število antralnih foliklov, izmerjenih z sonoAVC, močno korelira z označevalci fertilne sposobnosti, kot sta FSH – folikle stimulirjoči hormon in AMH – antimüllerjev hormon.*

Pregled peritonealnih sprememb: *Ocenjujemo lego in razporeditev ginekoloških in neginekoloških organov, prisotnost tekočine v trebušni votlini.*

Pregled nožnice: *Ultrazvočno pregledamo nožnico in izključimo endometriotične vozlje; s 3D UZ lahko natančno določimo lego pred operacijo.*

Ultrazvok pri sledenju zdravljenja neplodnosti: *Pred stimulacijo jajčnikov z ultrazvokom izključimo patologijo, ki bi lahko neugodno vplivala na stimulirani ciklus.*
Med stimulacijo sledimo z ultrazvokom rast foliklov in rast endometrija. S 3D UZ lahko hitreje in avtomatično merimo število in volumen foliklov (sonoAVC) in tako ocenimo vpliv stimulacije na rast in v postopku stimulacije spreminjamo zdravljenje in ocenimo verjetnost za pojav OHSS (ovarijski hiperstimulacijski sindrom).
Pri punkciji vedno uporabljamo UZ vodilo za iglo, s pomočjo dopplerskega UZ se pri punkciji izognemo večjim žilam v okolici nožnice in na poteku igle. S pomočjo 3D UZ lahko določimo folikle, ki imajo morfološko dober izgled.
Pred prenosom zarodka lahko z UZ določimo kot med maternično vratom in telesom maternice. Pri prenosu zarodka lahko z 2D vaginalnim UZ sledimo uvajanju katetra v maternično votlino. S 4D UZ lahko sledimo uvajanju katetra v 3D prostoru maternice. S tem laže določimo mesto, kjer zarodek vbrizgamo, in se izognemo nepotrebnim dotikom svoda maternice, ki lahko povzroči krvavitev v bližini zarodka.

Zaključki *Vse več ultrazvočnih naprav nam nudi poleg 2D prikaza tudi 3D in 4D, zato je pomembno, da se naučimo te aplikacije izkoriščati in uporabljati pri vsakodnevnem delu. Posnete volumne lahko kadar koli dodatno ocenjujemo v vseh želenih ravninah. Pri nejasnostih lahko volumne posredujemo svojim kolegom in morebitno nejasnost rešujemo skupaj.*

Ključne besede *ultrazvok; 3D; 4D; neplodnost; sonoAVC; VOCAL*

Abstract

Background *Ultrasound examination is becoming a more and more important diagnostic tool in infertility treatment. Development of ultrasound equipment offers a lot of information about the physiology and morphology of gynecological organs. Beside the 2D view on structures, the new 3D technology enables us to view the whole volume in all planes. 4D view enables us a 3D view in certain time, i.e. a 3D live scan.*

Content *Ultrasound is used in fertility management for infertility diagnostics and in following of treatment.*
Ultrasound in infertility diagnostics: *Ultrasound is used for examination of uterus, tubes, ovaries and peritoneal cause of infertility. It can be used in different menstrual phases: proliferative, periovulatory and secretory phase.*
Examination of uterus: *A 2D scan can measure the size of the uterus (length, width and depth) and a 2D flow (colour and power doppler). With 3D technology we can measure the whole volume with VOCAL (virtual organ computer-aided analysis) and 3D circulation with the index (VI – vascular index, FI – flow index and VFI – vascular flow index) in the uterus. A 2D scan can help us define uterine malformations, fibroids and adenomyosis to a certain extent. However, a 3D scan offers more accurate diagnosis of these malformations. Endometrium is examined separately. With 2D the width is measured and morphology and focal lesions (polyp, fibroids, adhesions) are examined. With 3D the real sagital plane for the width measurement can be defined . We can measure the volume of endometrium and subendometrium and 3D circulation in endometrium and subendometrium. The FIS (fluid instlation sonography) is very useful when examining the endometrium; saline or gel can be used for uterine instalation. We can measure and define the position of the structures in the endometrium more accurately when they are surrouned by saline or gel. We can view these structures with a surface view, similar to the one used for hysteroscopy. With this information we can explain the pathology to the patient and easily plan the surgical procedures.*
Examination of the tubes: *With 2D US we can see the tubes in the pelvis only if there are dilatations, but sometimes it is difficult to distinguish them from the neighbouring formations. With a 3D ultrasound we can define the shape and continuity of the tube and we can view the tube from different angles (inversion mode). Different contrast media are used for determining tubal patency. Tubal patency can be diagnosed with 2D HyCoSy (Hysterosalpingo Contrast Sonografy) or 3D HyCoSy.*
Examination of the ovary: *With the 2D ultrasound the size of ovaries is measured and the morphology of ovaries is examined. With the 3D ultrasound the volume of the ovaries, follicles, cysts and tumors can be measured. Furthermore, position of the ovaries with regard to their surrounding can be defined. With the 3D surface mode we can see the surface view of the inner layer of the follicle or the cyst. The volume of the liquid structures can be*

measured with VOCAL or sonoAVC (sono automated volume count). The number of the antral follicles strongly correlates with fertility potential markers such as FSH and AMH.
Examination of peritoneum: *The position of gynaecological organs and ascites are defined.*
Examination of vagina: *Endometriotic nodules can be excluded with ultrasound. A 3D ultrasound can define the exact position of the nodule.*

Ultrasound in the following of infertility treatment: *Before the ovarian stimulation it is mandatory to exclude pelvic pathology that can influence the stimulation.*
Ovarian stimulation: *We follow the natural or stimulated cycles with an ultrasound in view of follicular and endometrial growth. SonoAVC offers us automatic volume count of all follicles. This information enables us to change the stimulation protocol and avoid OHSS more accurately comparing to the standard 2D technology.*
Oocyte puncture: *US puncture is done with ultrasound-guided needle. Great vessels around the vagina and on the needle line can be avoided if colour doppler is used. With 3D surface mode good quality follicles can be identified.*
Embryotransfer (ET): *The angle between cervical canal and corpus uteri can be measured before the embryotransfer. The introduction of the ET catheter can be followed with the 2D transabdominal probe. More exact location of the catheter can be visualized with 4D US. With this method we can avoid touching the uterine fundus with the catether and avoid bleeding in the foetus surroundings.*

Conclusions — *There is an increasing number of ultrasound machines offering us beside 2D, 3D and 4D technology. It is important to learn the applications and use them in our daily practice. The recorded volumes can be examined at any time in any plan. In any unclear pathology the recorded volume can be send for second opinion and discussed further.*

Key words — *ultrasound; 3D; 4D; infertility; sonoAVC; VOCAL*

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