

# Adnexal Masses

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## ABSTRACT

Fallopian tube inflammatory disease and tubal pregnancy are closely related. Inflammatory disease of the fallopian tubes leads to the inability for fertilization of the oocyte when the fallopian tube is completely closed; it also makes the path difficult for the gamete to transfer into the uterine cavity. The possibility of ectopic pregnancy is rising as a result of deformity and reduced mobility of the fallopian tubes. Most ectopic pregnancies occur in the fallopian tubes and rarely in other structures. It used to be difficult to diagnose an ectopic pregnancy, but now with two-dimensional (2D)/three-dimensional (3D) ultrasound and serum  $\beta$  human chorionic gonadotropin (hCG), the diagnosis is easy, and women with an ectopic pregnancy should no longer be in a situation where this pathological situation is a life-threatening diagnosis. Noninvasive transvaginal ultrasound (TVU) 2D/3D examination provides an opportunity for rapid selection of patients and candidates for direct laparoscopic (LPSC) access at the first examination in "everyday" practice. Due to the increased use of high-resolution TVU, around 80% of ectopic pregnancies are diagnosed on time, without severe abdominal hemorrhage. TVU identification of an adnexal mass, empty uterine cavity, and positive pregnancy test are the gold standard for diagnosis.

**Keywords:** Ectopic pregnancy, Fallopian tube inflammatory disease, Positive pregnancy test, Transvaginal two-dimensional/three-dimensional ultrasound examination.

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## CHRONIC INFLAMMATION OF THE FALLOPIAN TUBES

### Introduction

Inflammatory disease of the fallopian tubes is closely related to subfertility in women. This condition leads to the inability for fertilization of the oocyte when the fallopian tube is completely closed; it also makes the path difficult for the gamete to transfer into the uterine cavity. The possibility of ectopic pregnancy is rising as a result of deformity and reduced mobility of the fallopian tubes. Noninvasive 2D/3D ultrasound examination provides an opportunity for rapid selection of patients and candidates for direct LPSC access at the first examination in "everyday" practice. A four-dimensional (4D) live hystero-contrast sonography gives excellent results in the examination of permeability disorders of the fallopian tubes and allows physicians to evaluate tubal patency status relatively easily in the absence of 2D/3D ultrasound signs for acute or chronic inflammatory disease. These new ultrasound techniques provide a safer approach compared to conventional techniques, such as X-ray and hysterosalpingography.

### Ultrasound Characteristics

Obstruction at the end of the fallopian tube (ciliary agglutination) results in the appearance of hydrosalpinx.

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The 2D/3D ultrasound detects a formation that has an irregular shape and hypoechoic structure inside the formation (liquid).<sup>1</sup> On the longitudinal section, it has a pipe-like appearance. Other important ultrasound markers are "pseudoseptum," hyperechogenic linear shadows that begin at one wall of the formation but never end at the other side, as in proper septa, and have no vascularization in comparison to proper septa, which are detected in cystic tumors. Another typical ultrasound marker for chronic hydrosalpinx is a "beads on a string" sign.<sup>2</sup> On 2D, there are hyperechogenic spotted

shadows without elevated dimensions, unlike true papillae in cystic ovarian tumors (2–3 mm), detected on the transversal section of the fallopian tube. Another important sign is that these hyperechoic dot shadows have visual symmetry at the transverse section as a result of a degenerative change in the endosalpinx of the fallopian tube. On the 3D longitudinal section, the same hyperechogenic structures are now clearly recognizable as lines that travel through the wall of the fallopian tube as a result of degenerative endosalpingeal remnant folds (Figs 1 to 10).

## ECTOPIC PREGNANCY

### Introduction

The definition of ectopic pregnancy includes any pregnancy that is not implanted in the endometrial cavity. Most ectopic pregnancies occur in the fallopian tubes and rarely in other structures. It used to be difficult to diagnose an ectopic pregnancy, but now with 2D/3D ultrasound and serum  $\beta$  hCG, the diagnosis is easy, and women with an ectopic pregnancy should no longer be in a situation where this pathological situation is a life-threatening diagnosis. The classic clinical presentation suggestive of an ectopic pregnancy is a delay in the expected menstrual cycle, a positive pregnancy test

with no detected gestational intrauterine sac on ultrasound, sometimes associated with pain, and scanty vaginal bleeding at a certain percentage, but there are other symptoms as well, including abdominal and cervical motion tenderness, shoulder tip pain, and collapse.

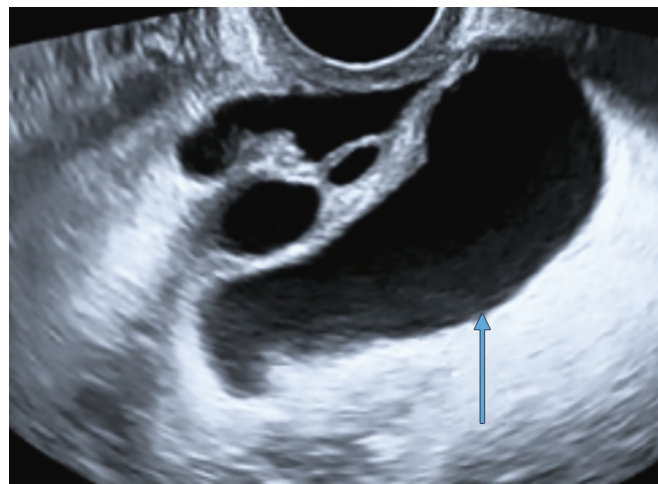
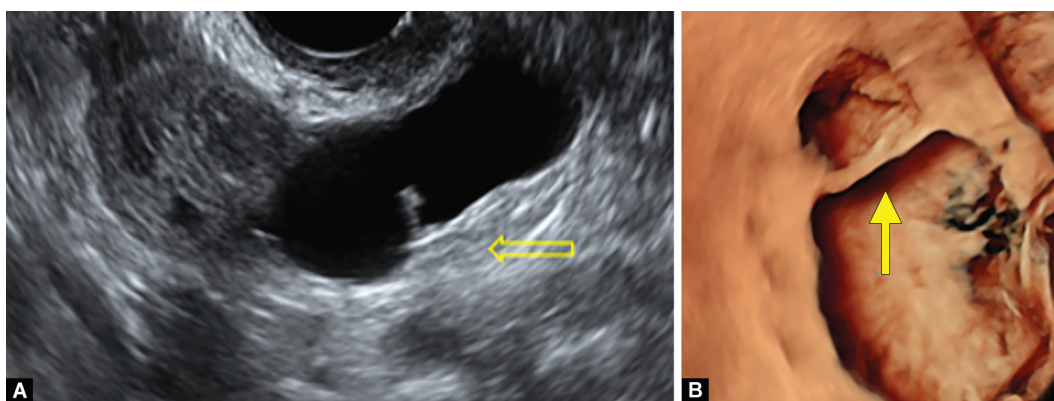
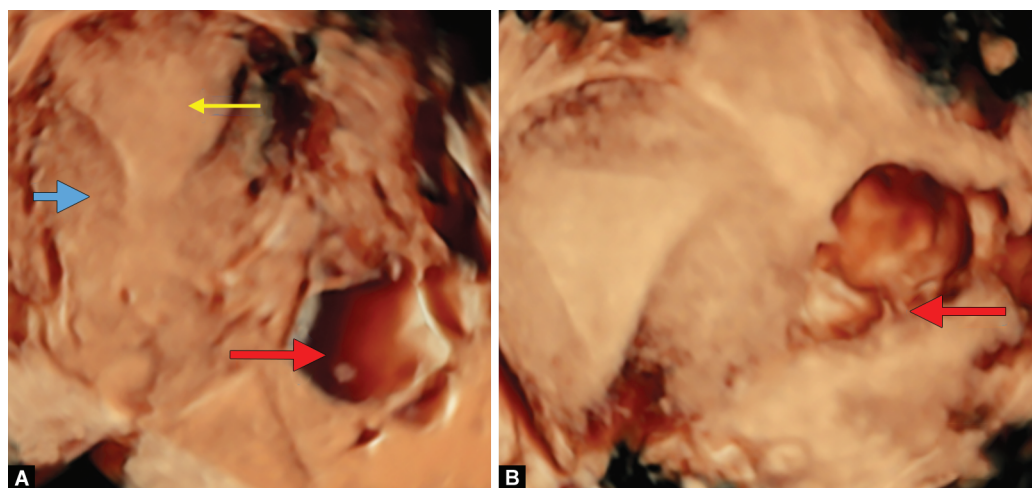


Fig. 1: A 2D ultrasound of hydrosalpinx. Ovoid structure “pipe” sign (blue arrow)

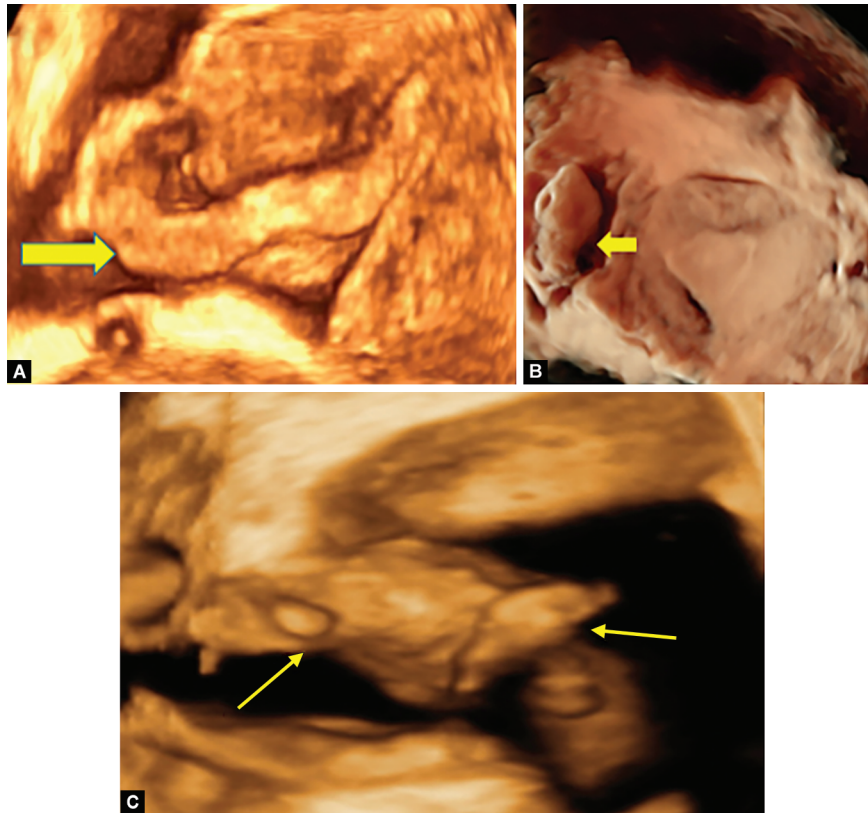


Figs 2A and B: A 2D/3D ultrasound of hydrosalpinx with hyperechoic pseudoseptum (partial septum) (arrows)

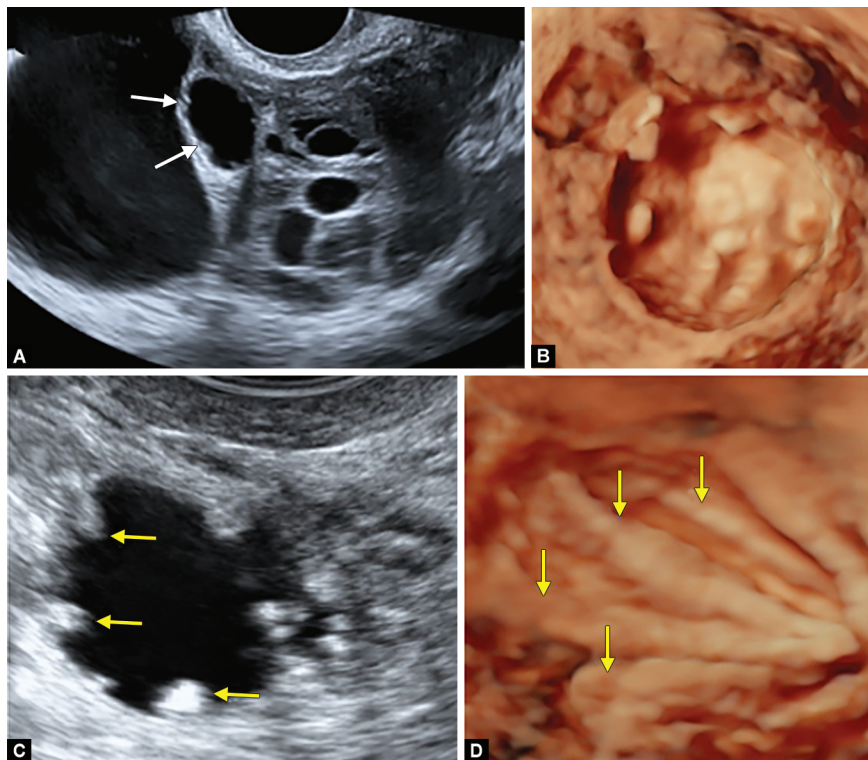


Figs 3A and B: A 3D/4D ultrasound of hydrosalpinx: 3D rendering of uterus (blue arrow), endometrium (yellow arrow), hydrosalpinx (red arrow)

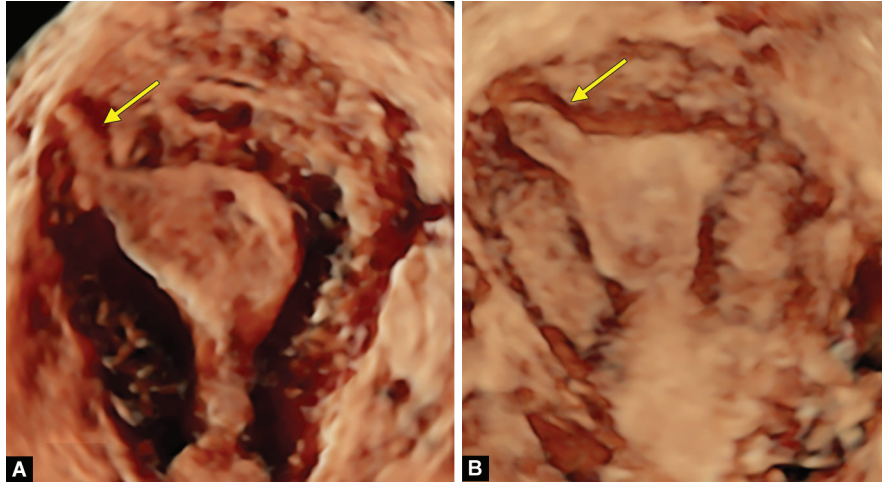




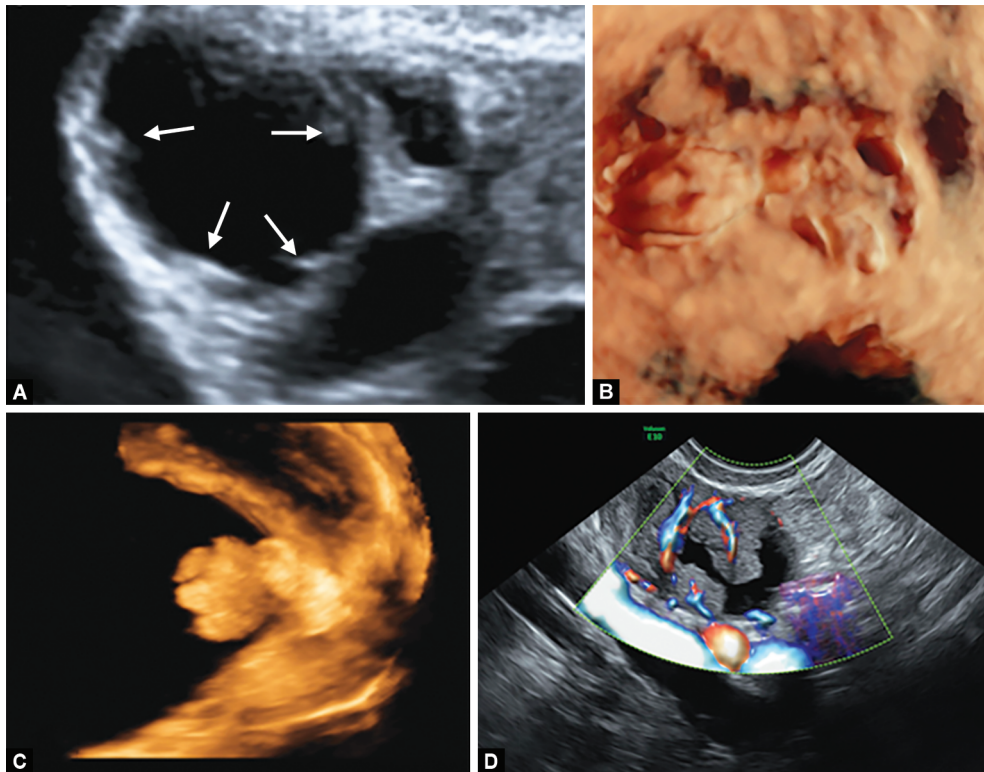
**Figs 4A to C:** A 3D/4D vaginal ultrasound of inflamed tube (salpingitis). Thickened wall of the tubes (A and B) and introverted fimbria in the inflamed tube (C)



**Figs 5A to D:** A 2D/3D vaginal ultrasound of chronic hydrosalpinx: the “beads on a string” sign hyperechogenic spotted shadows (arrows) (A to C); on the longitudinal section on the wall, the same hyperechogenic structures are now clearly recognizable as lines that travel through the wall of the fallopian tube as a result of degenerative and flattened endosalpingeal fold remnants (D)



**Figs 6A and B:** A 3D vaginal ultrasound and PID: chronic hydrosalpinx. Dilated intramural part of tube



**Figs 7A to D:** A 2D/3D and color Doppler ultrasound between chronic hydrosalpinx and ovarian cystadenocarcinoma: pseudopapillary structures (“beads on a string sign”) (A and B) different than proper papillary projection in ovarian cystadenocarcinoma—different dimension (C) and present color Doppler signal on papilla (D)

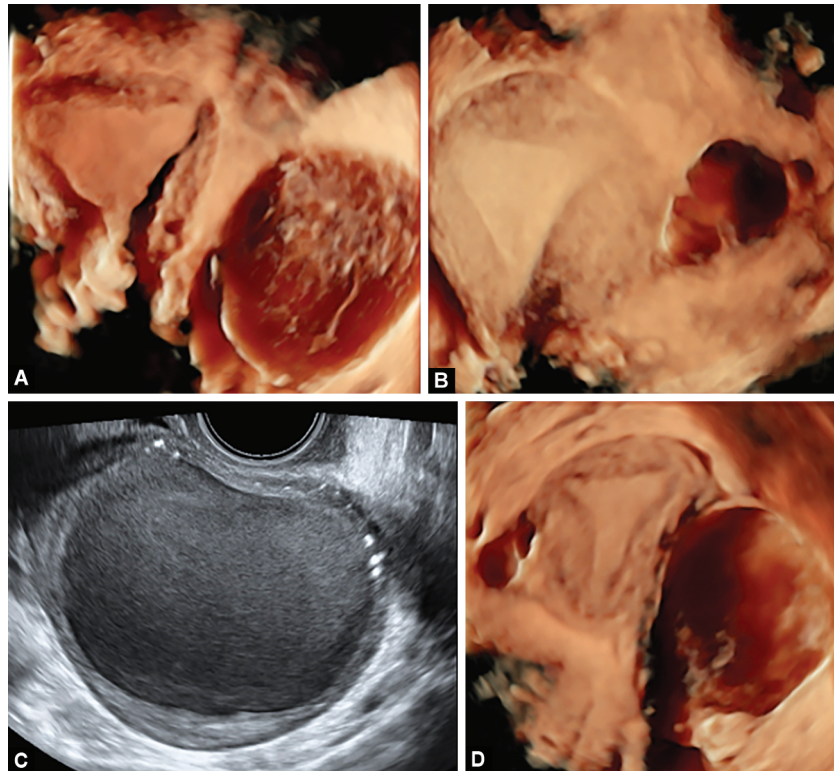
**Ultrasound Characteristics**

Due to the increased use of high-resolution TVU, around 80% of ectopic pregnancies are diagnosed on time, without severe abdominal hemorrhage. TVU identification of an adnexal mass, empty uterine cavity, and positive pregnancy test are the gold standard for diagnosis.

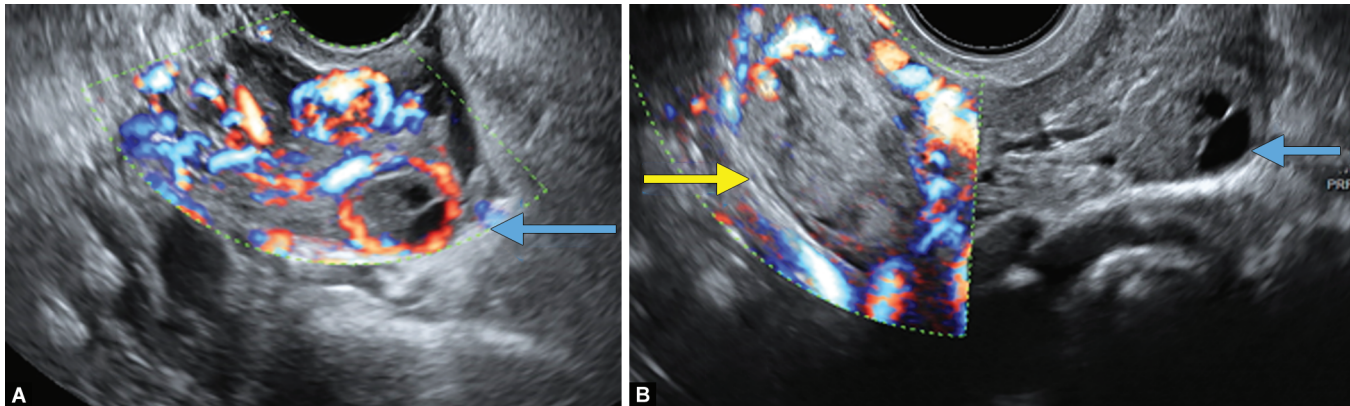
Ultrasound findings are signs “ring of fire” of the corpus luteum on the ipsilateral side in 75% of the patients, the “blob

sign,” that is, an inhomogeneous mass adjacent to the ovary in 60% of the patients, a hyperechoic ring with hypoechoic content in 20% of the patients, and in 13% of the patients, we can identify gestational sac with or without embryo (Figs 9 and 10).<sup>3,4</sup> On 2D/3D vaginal ultrasound of the pouch of Douglas, we can see fluid with a ground glass appearance (a sign of intra-abdominal hemorrhage) and blood in Morison’s pouch that indicates significant intra-abdominal hemorrhage (Fig. 11).





**Figs 8A to D:** A 3D rendering: corpus luteum cyst (A), hydrosalpinx (B), and 2D/3D of ovarian abscesses arising within an endometrioma (C and D)



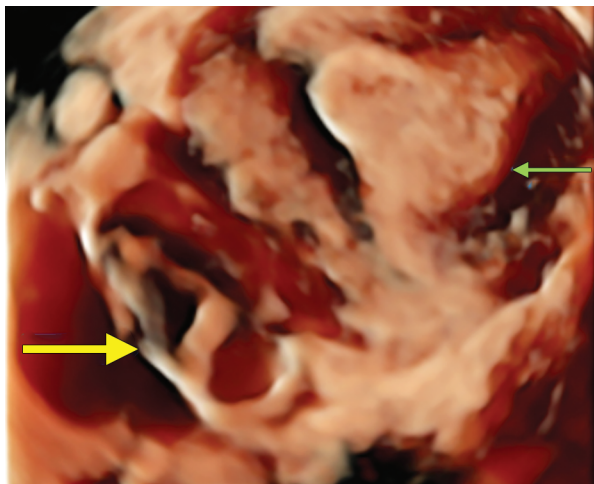
**Figs 9A and B:** A 2D and color Doppler of ectopic pregnancy. Ultrasound sign “ring of fire” of corpus luteum on the ipsilateral side (A), the inhomogeneous mass adjacent to the ovary (B) (ovary—blue arrow, yellow arrow—ectopic pregnancy)

### Ectopic Pregnancy in the Horn of the Uterus

This type of ectopic pregnancy is called cornual pregnancy. Possible reasons for occurrence are previous salpingectomies, uterine anomalies, and intrauterine adhesions, but this type of pregnancy very rarely occurs without clearly visible pathological conditions of the uterus. Different entities of the topography of this type of ectopic pregnancy have different therapeutic approaches and, more importantly, different prognosis, according to the fertile potential of the uterus. A recent study addresses this problem and the

dilemmas surrounding the term cornual pregnancy for all these conditions and classifies cornual pregnancy into six categories starting from “angular ectopic pregnancy” over “ectopic pregnancy in a rudimentary horn” in the unicornuate uterus (communicate or noncommunicate rudimentary horn). These three subtypes are recognized as ectopic pregnancies. The other three subgroups are pregnancies detected in the horn of the uterus with anomaly (bicornuate or severe septum of the uterus) and “angular pregnancies,” these are certainly intrauterine pregnancies.<sup>4</sup> Namely, ectopic pregnancies in the



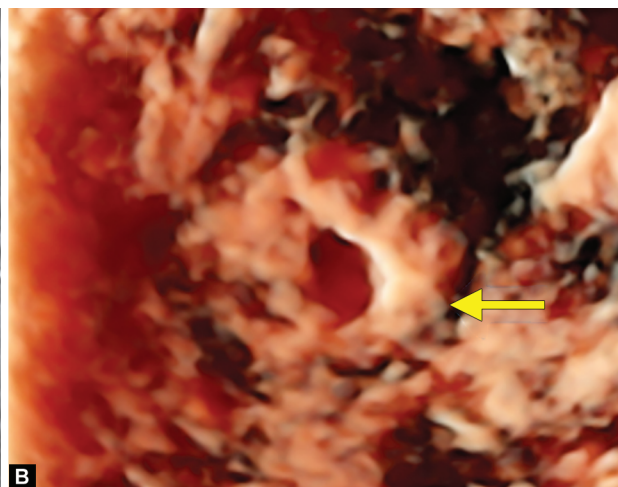
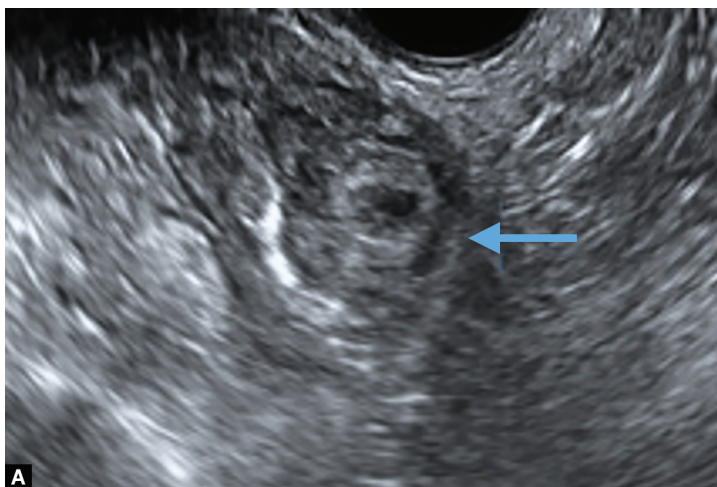


**Fig. 10:** A 3D rendering of ectopic pregnancy, "blob sign"—inhomogeneous mass adjacent to the ovary—hematosalpinx (yellow arrow)

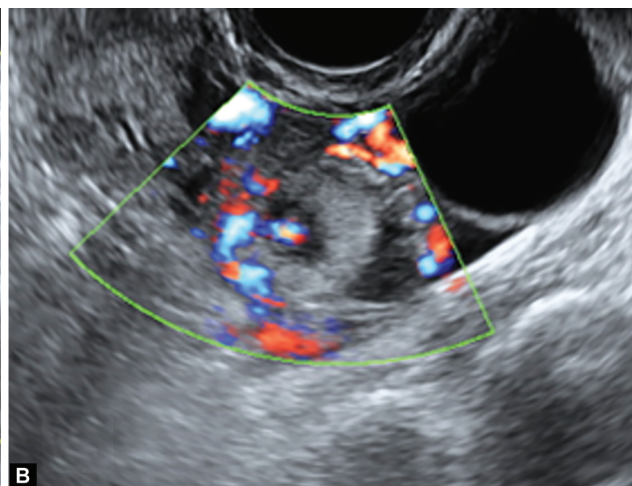
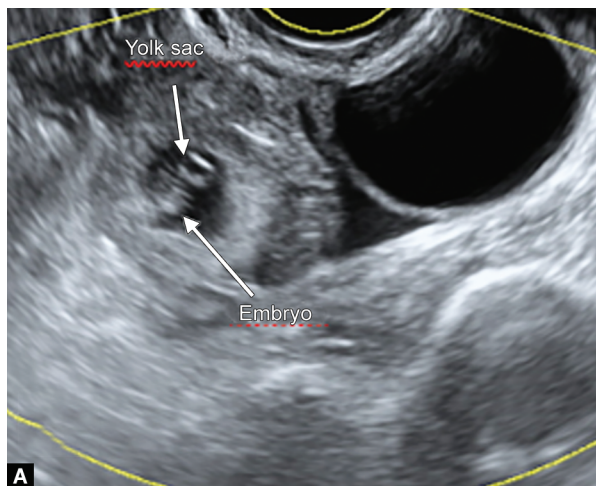
interstitial part of the fallopian tube, as well as pregnancies in rudimentary horns, require surgical treatment. In contrast, pregnancies in the horn with uterine anomalies can be solved with less invasive techniques, such as aspiration and revision of the uterine cavity under ultrasound, which is important for



**Fig. 13:** A 2D vaginal ultrasound of pouch of Douglas—fluid with ground glass appearance, sign of intra-abdominal hemorrhage



**Figs 11A and B:** A 2D/3D ultrasound of ectopic pregnancy, hyperechoic ring with hypoechoic content



**Figs 12A and B:** A 2D/3D gestational sac with embryonic tissue adjacent to the ovary, positive cardiac activity as noted by the color spot in the center

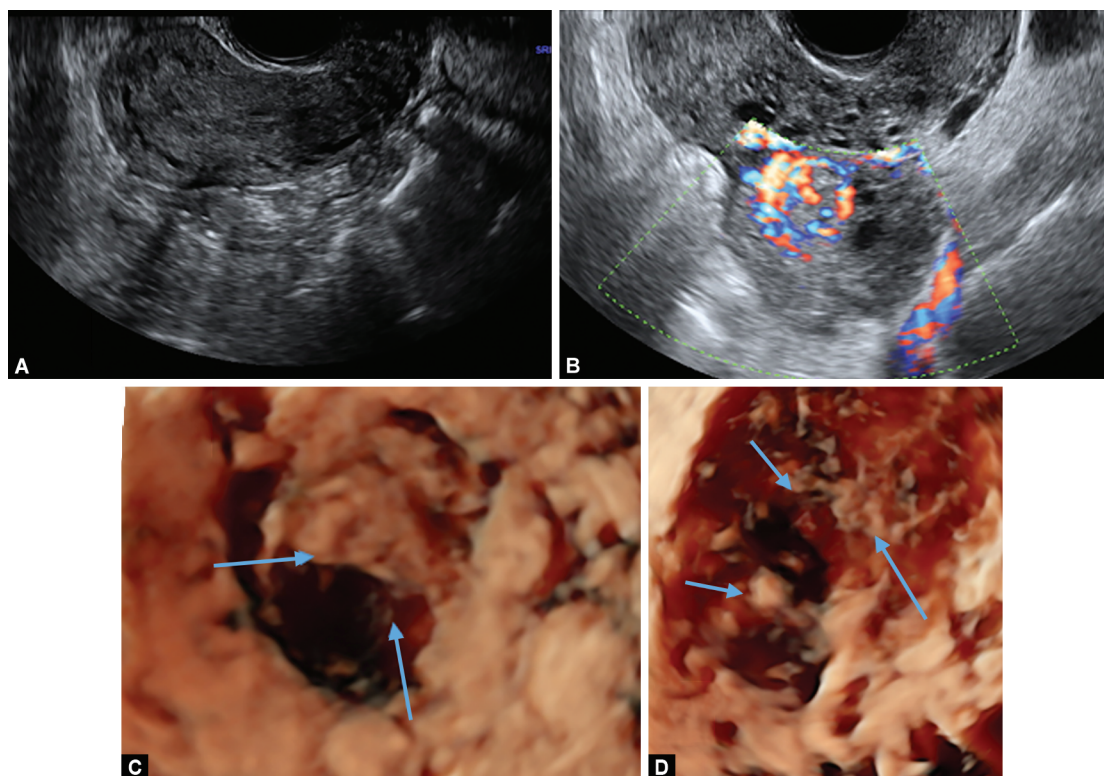


the future integrity of the uterus. That is why 2D, especially 3D and 4D, vaginal ultrasound is essential for accurate diagnosis and topography of the change.

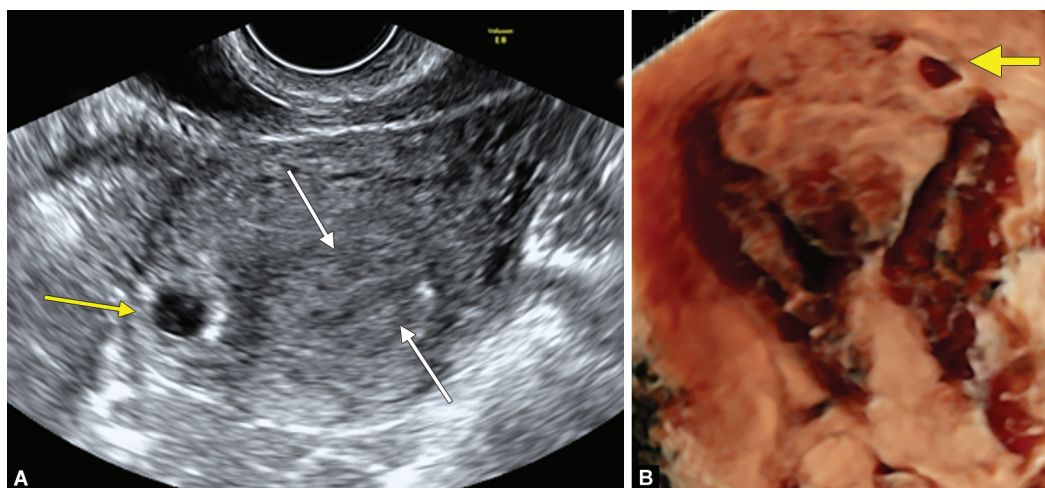
The incidence of interstitial pregnancy is 2–4%. Ultrasound signs for ectopic interstitial pregnancy are a visible gestational sac with thick (under 5 mm) myometrium surrounding the sac, there is no contact between the gestational sac and the endometrial cavity, and clear peripheral color Doppler

vascularization of the gestational sac is present. A 3D/4D vaginal ultrasound is essential, the coronal image of the uterus shows a gestational sac, and myometrial lining around the sac that separates it from the endometrial cavity (Figs 12 to 15).<sup>5</sup>

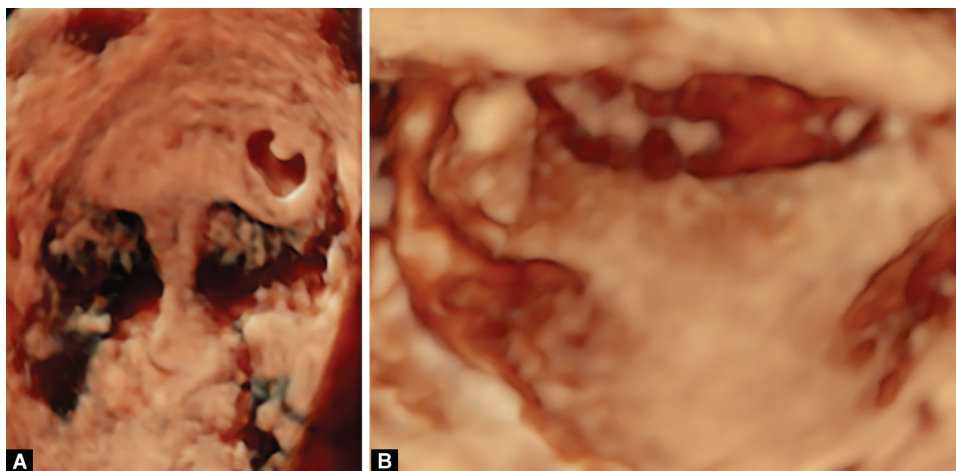
Angular ectopic pregnancy is an intrauterine pregnancy, referring to implantation in the upper part of the uterine horn (endometrial cavity) medial to the uterotubal junction (Fig. 16).



**Figs 14A to D:** Case of placental site tumor. Yang patient with amenorrhea, high blood levels of  $\beta$  hCG, 2D vaginal ultrasound of uterus—empty cavum (A and B), same case, tumor near to uterus—rich vascularized, 3D inhomogeneous mass (C and D)



**Figs 15A and B:** A 2D/3D ultrasonography of interstitial ectopic pregnancy: gestational sac and myometrial lining around the sac that separates it from the endometrial cavity (yellow arrows—pregnancy, white arrows—endometrium)



**Figs 16A and B:** A 3D vaginal ultrasound of “angular pregnancy,” implantation in the upper part of the horn but it is in the uterine cavity (A), after curettage (B)

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