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Review Articles

Cornual, interstitial, and angular pregnancies: clarifying the terms and a review of the literature

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ABSTRACT

The terms "cornual," "interstitial," and "angular" pregnancies are used inconsistently in the literature. Some sources use "interstitial" and "cornual" synonymously, while others reserve "cornual" for gestations in bicornuate or septate uteri; others distinguish interstitial from angular pregnancy, while in practice, many physicians are unfamiliar with the latter designation. This article aims to clarify the terms and review the literature with respect to diagnosis and prognosis, with attention to the potential roles of 3D ultrasound and magnetic resonance imaging.

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1. Introduction

Ectopic pregnancy is defined as implantation of a gestation outside the endometrial cavity [1]. A ß-human chorionic gonadotropin (hCG) level above the discriminatory zone (≥2000–2200 mIU/mL International Reference Preparation) with the absence of an intrauterine pregnancy (IUP) has historically been highly suggestive of an ectopic pregnancy [1], although more recently there has been evidence against the reliability of the ß-hCG discriminatory level [2,3], making imaging assessment all the more important. The majority of ectopic pregnancies occur in the fallopian tube (95%), least commonly in the interstitial portion [1]. Dahnert's *Radiology Review Manual* defines an interstitial pregnancy as follows: "interstitial (cornual) ectopic=ectopic pregnancy with eccentric location in relation to the endometrium+close to the uterine serosa [1]." However, according to Williams' *Obstetrics*, "although used interchangeably, (these) are slightly different implantations. Cornual implantation describes those in the upper and lateral uterine cavity, whereas interstitial denotes those implanted within the proximal intramural portion of the tube" [4]. Still other sources in both the radiology and obstetrics literature reserve "cornual pregnancy" only for gestations in a bicornuate or septate uterus [5,6]. Amidst such discussion, the term "angular pregnancy" sometimes arises, defined as "implantation within the endometrium of the lateral angle of the uterus, medial to the uterotubal junction" [5]. Although angular pregnancy is a term unfamiliar to many radiologists, this deficiency should be remedied because it is a reported clinical entity (Fig. 1). Furthermore, understanding the difference between all of these entities is clinically important because the conditions' natural histories and management differ.

The objective of this review is to clarify the terms cornual, interstitial, and angular pregnancy, and provide a scholarly analysis of the literature on this important topic for Ob/Gyn imagers. It is worthy of attention given the development of three-dimensional (3D) ultrasound (US) and magnetic resonance imaging (MRI) since this topic was last seriously considered in the literature prior to the turn of the century.

2. Anatomy and nomenclature

The fallopian tubes and uterus are embryologically derived from the Müllerian ducts: the proximal segments remain unfused and develop into the fallopian tubes, whereas the distal segments fuse to give rise to the uterus and upper four-fifths of the vagina [7,8]. The fallopian tube has four named segments: (from laterally to medially) the infundibulum, ampulla, isthmus, and interstitial segments [7]. The interstitial (or intramural) segment is approximately 1–2 cm in length, traversing the muscular myometrial layer of the uterus and opening via the inner tubal ostium into the uterine cavity [9]. Thus, by strict anatomic definition, interstitial pregnancy should refer to a pregnancy in the interstitial portion of the fallopian tube. Of tubal ectopic pregnancies, 2%–4% are reported to occur in this location [7].

By 12 weeks' gestational age, the uterus demonstrates its normal morphology: fused external contour of the myometrium and triangular-shaped endometrial/uterine cavity with base directed

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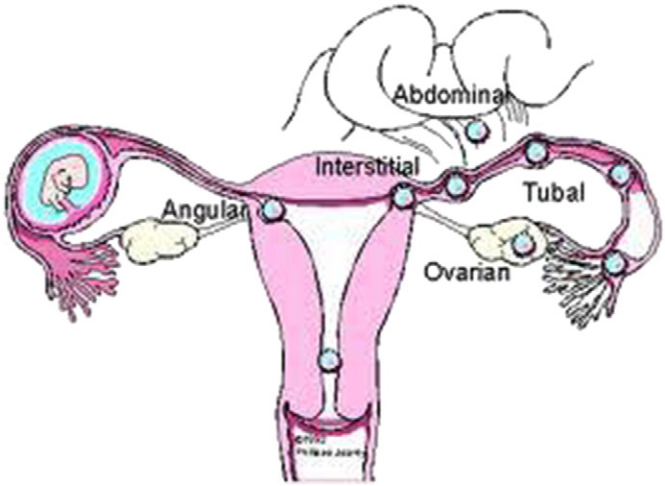

Fig. 1. Diagram of pregnancy locations [35].

cranially and apex caudally toward the cervix and vagina [8] (Fig. 2). The uterus is maintained in location by multiple ligaments, including the round ligament which crosses the fallopian tube at the uterotubal junction. Anatomically, the superior two-thirds of the uterus is the body; the inferior one-third is the cervix; and the superolateral regions of the uterine cavity where the fallopian tubes enter are the uterine horns or cornua (Latin: singular cornu, plural cornua) [9]. Accordingly, a normal uterus has two cornua, one on the right side and one on the left (Fig. 3).

Abnormal uterine configurations, most commonly classified according to the schematization of the American Fertility Society (Fig. 4) [10], include didelphus, bicornuate, septate, and drug-eluting stent drug-related (usually T-shaped) configurations—all of which *also* have two cornua—as well as the unicornuate configuration, which may have only one cornu (right or left). Thus, by strict anatomic definition, a cornual pregnancy should refer to a pregnancy in the cornu of the uterus—i.e., in the superiolateral region of the uterine/endometrial cavity where the fallopian tube enters—whether the uterus is normal in configuration or has a Müllerian duct anomaly.

3. The confusion

The taxonomic confusion regarding the terms cornual, interstitial and angular pregnancies appears distillable into the following three categories of issues.

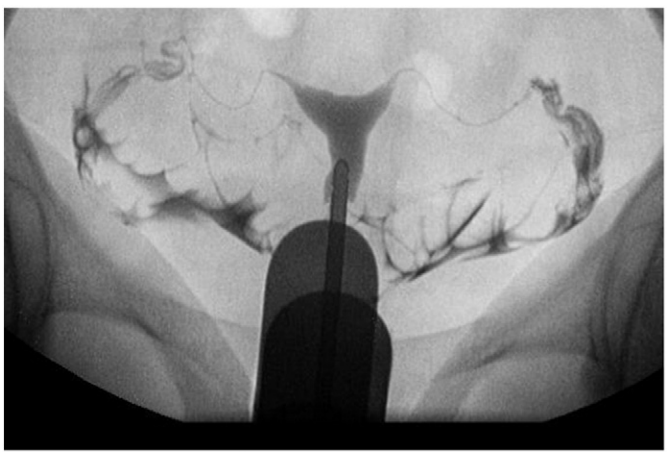

Fig. 2. A 33-year-old woman with infertility at our institution. This normal hysterosalpingogram demonstrates the triangular-shaped uterine/endometrial cavity, opacification of the thin fallopian tubes, and normal bilateral intraperitoneal spillage of contrast into the pelvic cavity.

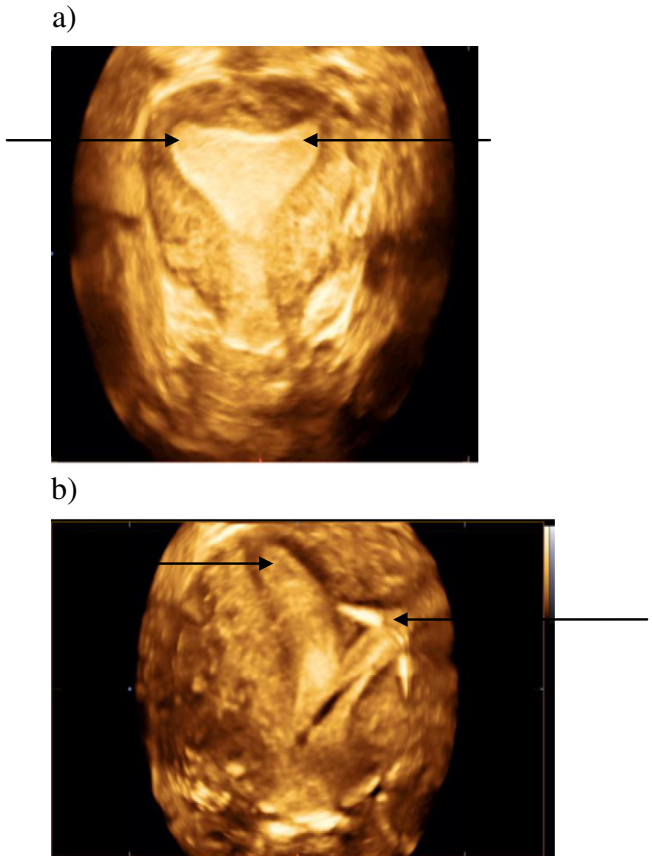

Fig. 3. Coronal 3D **US** images from our institution demonstrating the two uterine cornua/horns (arrows) in a normal uterus (a) and a uterus with a Müllerian duct anomaly (b) (septate); the latter demonstrates an echogenic polyp on the right and shadowing intrauterine device on the left.

First, as others have pointed out as well, the terms "interstitial" and "cornual" pregnancy are frequently used synonymously. For example, Lin et al. [11] in *RadioGraphics* (2008) wrote, "Cornual pregnancy… is often used interchangeably with interstitial pregnancy." Similarly, Moawad et al. [12] in *Am J Obstet Gynecol* (2010) wrote, "Interstitial pregnancy sometimes is mistakenly referred to as cornual pregnancy, and frequently confused with angular pregnancy." The consequence of synonymous use of the terms "interstitial" and "cornual" pregnancy is a blurring of the distinction between the two entities.

Second, the term "cornual" pregnancy is sometimes but not always applied just to pregnancies in bicornuate or septate uteri. Reports of cornual pregnancy date back to 1952 by Johnston and Moir [6], who defined a cornual pregnancy as being "in one horn of a bicornuate uterus, or, by extension of meaning, in one lateral half of a uterus of bifid tendency." By 1982, however, Maher and Grimwade [13] write that, in practice, many Ob/Gyns also consider a pregnancy located in the cornual region of a normal uterus to be a cornual pregnancy as well: "we agree that there is much confusion over the terms interstitial, cornual and angular pregnancy, [however] the fact remains that any pregnancy occurring in the cornual region of a normal uterus is still referred to by many gynecologists, if not the majority, as a 'cornual pregnancy'" Although many papers in reputable Ob/Gyn journals continue to use Johnston's original definition of a cornual pregnancy as one occurring in a congenitally abnormal uterus [14,15], the current version of *Williams' Obstetrics* supports Maher and Grimwade, defining cornual implantation as occurring in the upper and lateral uterine cavity of an anatomically normal uterus [4]. The consequence of this dual—or "loose"—use of the word cornual is imprecision and confusion. Thus, putting aside the fact that common practices can be hard to change, at the very least,

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