

From Double Bubble to Diagnosis: A Structured Ultrasound Approach to Congenital Duodenal Obstruction

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Objective

Congenital duodenal obstruction (CDO) is a major cause of fetal upper gastrointestinal obstruction; however, the “double bubble” sign alone does not define the level or mechanism. We aimed to develop a structured ultrasound approach to refine prenatal diagnosis and support targeted perinatal management.

Methods

A standardized, anatomy-based ultrasound protocol was developed, incorporating systematic evaluation of duodenal morphology, pancreatic anatomy, and mesenteric vascular relationships using grayscale and color Doppler imaging.

Results The proposed approach defines key diagnostic steps based on anatomical assessment. Initial evaluation focuses on the configuration of the dilated duodenum; distinguishing a rounded “double bubble,” elongated, or C-shaped loop supports localization of obstruction and differentiation between proximal and distal pathology. High-resolution imaging enables identification of intraluminal etiologies, including duodenal web, visualized as a thin echogenic membrane. Assessment of the pancreas in axial and coronal planes allows detection of pancreatic tissue encircling the duodenum, consistent with annular pancreas as an extrinsic cause.

Color Doppler interrogation of mesenteric vessels refines diagnosis: the relationship between the superior mesenteric artery and vein supports identification of malrotation and Ladd’s bands, while variant vascular anatomy—such as preduodenal portal vein or compression patterns suggestive of superior mesenteric artery syndrome—indicates distal extrinsic obstruction. In the absence of identifiable intraluminal or extrinsic causes, duodenal atresia remains a diagnosis of exclusion.

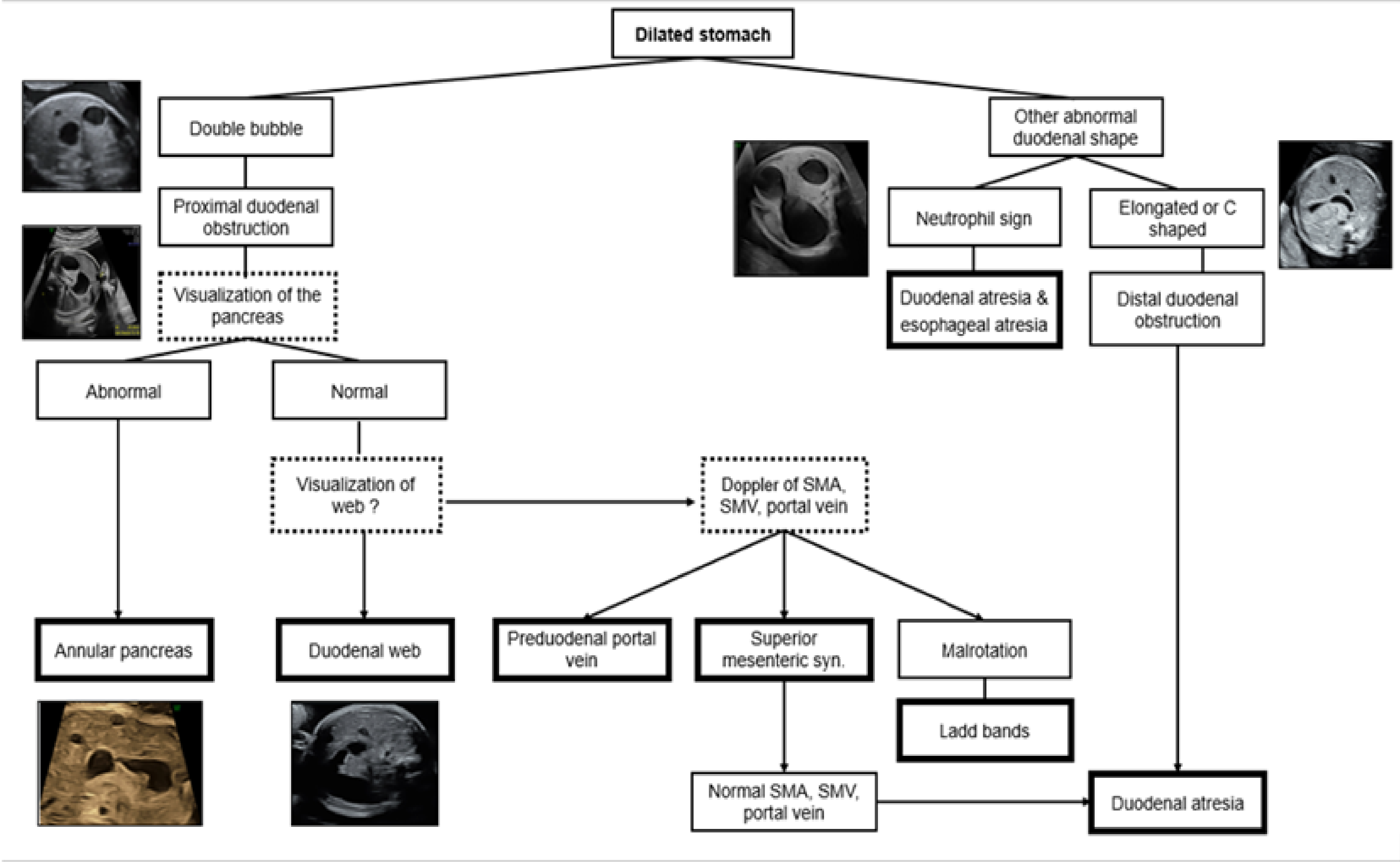


Figure 1. Stepwise sonographic approach to the prenatal diagnosis of congenital duodenal obstruction.

Conclusion

A structured, anatomy-based ultrasound approach integrating duodenal morphology, pancreatic configuration, and mesenteric vascular anatomy improves diagnostic precision in CDO. This framework enables accurate classification of the underlying mechanism and supports optimized prenatal counseling and perinatal planning.

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