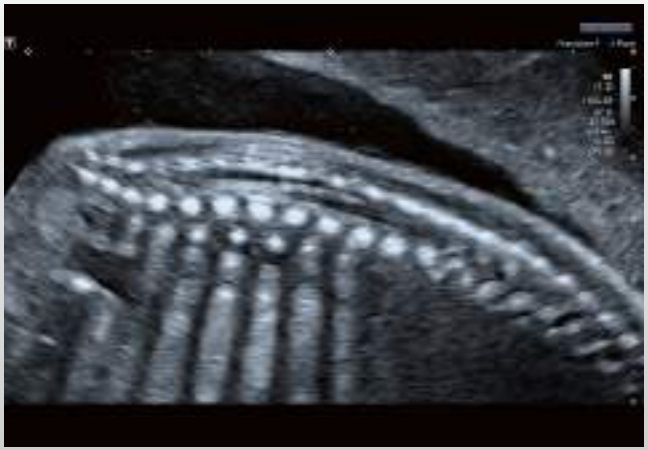
Canon

Clinical image gallery

Second trimester anomaly scan



Women's Health

How to do a second trimester anomaly scan

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This clinical image gallery is a pictorial representation of the review article "How to do a second trimester anomaly scan," written by Natalia Carmen Prodan, Markus Hoopmann, Gertruda Jonaityte and Karl Oliver Kagan, originally published in Archives of Gynecology and Obstetrics under a Creative Commons Attribution 4.0 International License.
In this clinical image gallery, a picture and quote from Karl Oliver Kagan has been added. The content of the original paper has been updated to be consistent with the updated ISUOG Practice Guidelines for routine mid-trimester fetal ultrasound scans (Ultrasound Obstet Gynecol 2022; 59: 840–856. DOI: 10.1002/uog.24888), published in May 2022.
The imaging requirements according to different standards were explicitly stated with each image for better readability.
The original article can be accessed at https://doi.org/10.1007/s00404-022-06569-2

Abstract
A systematic evaluation of the fetal anatomy as part of the second trimester ultrasound examination in pregnancy is useful in detecting pregnancy complications, fetal abnormalities, and genetic diseases. We aim to illustrate the basic and detailed second trimester scan, according to current international and national guidelines, as well as to our own every-day practice in the Department for Prenatal Diagnosis at the University of Tübingen, Germany.

Keywords
Pregnancy · Fetal anomaly scan · Second trimester · Fetal defects

Ultrasound examination in pregnancy is one of the main pillars of modern obstetric care. It helps to establish an accurate gestational age and enables a timely detection of pregnancy complications such as fetal structural defects and genetic diseases, multiple gestations, fetal growth restriction, amniotic fluid volume abnormalities, abnormal fetal presentation and abnormal placentation. Timing of the ultrasound examination can be broadly divided into the following categories: a first trimester and a second trimester assessment and, in some settings, a third trimester scan.

The second trimester ultrasound assessment focuses on fetal sonoanatomy to detect fetal structural defects, as well as markers for chromosomal or genetic abnormalities. At present, approximately 50 % of all fetal abnormalities are detected prenatally, with detection rates varying widely[1]. For some organ-specific malformations, a structured screening programme has been shown to improve detection rates and outcomes[2]. A Cochrane meta-analysis to assess the effectiveness of second trimester screening in a low-risk population has been initiated[3]. Many scientific societies, among them the ISUOG (International Society of Ultrasound in Obstetrics and Gynecology)[4], the DEGUM (Deutsche Gesellschaft für Ultraschall in der Medizin)[5] and the AIUM (American Institute of Ultrasound in Medicine)[6], as well as national health authorities, such as the NHS (National Health Service) in the United Kingdom[7], have published guidelines, which define the standard sonoanatomical planes needed for a second trimester fetal examination. In general, national guidelines cover the basic scan requirements. Description of additional views required for a detailed examination is usually provided by scientific societies, which suggest that advanced skills are needed for its performance. This is specifically emphasized in the AIUM guidelines[6].

The ultrasound images on the following pages illustrate views, which are required for the completion of a detailed second trimester examination as recommended by ISUOG, AIUM and DEGUM, as well as additional planes and structures that are part of the scanning protocol in the Prenatal Diagnostic Department of the University Clinic for Obstetrics and Gynaecology in Tübingen. We have highlighted the images that are mandatory for the examination according to the ISUOG, AIUM, DEGUM and NHS-FASP guidelines. We also have marked the additional images that we routinely assess in our clinic as "Tübingen protocol." These images are not included in the national recommendations. Still, we believe that they provide valuable information for the pregnancy care.

The enclosed series of images were acquired in ideal conditions in patients with low body mass index, fetus in optimal position, normal amniotic fluid, no fibroids and no uterine malformations. They are also obtained in a series of patients. Therefore, we acknowledge that in everyday clinical practice, one may encounter situations where the acquisition of images of such quality is not possible. Still, every attempt should be made to demonstrate all the relevant structures. If this is not possible, it may be necessary to gently move the fetus with the other hand, to ask the patient to turn to the side, to send the patient for a walk and to empty the bladder or finally to rebook the patient 2 weeks later for another detailed ultrasound examination. Any limitation that affects image quality should be noted in the report.

"The second trimester anomaly scan still forms the basis of screening for fetal defects. It is, however, only effective when performed systematically and according to a standardized protocol. This gallery of exemplary images serves as a guide and shows where the relevant protocols have divergent requirements."

Prof. Oliver Kagan
University Hospital Tübingen,
Tübingen, Germany

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Fetal head

Transverse image of the head circumference at the level of the biparietal diameter, with midline falx, cavum septi pellucidi, thalami and lateral ventricle (ISUOG / AIUM / DEGUM / NHS-FASP)

Posterior fossa of the brain with cerebellum and cisterna magna (ISUOG / AIUM / DEGUM / NHS-FASP)

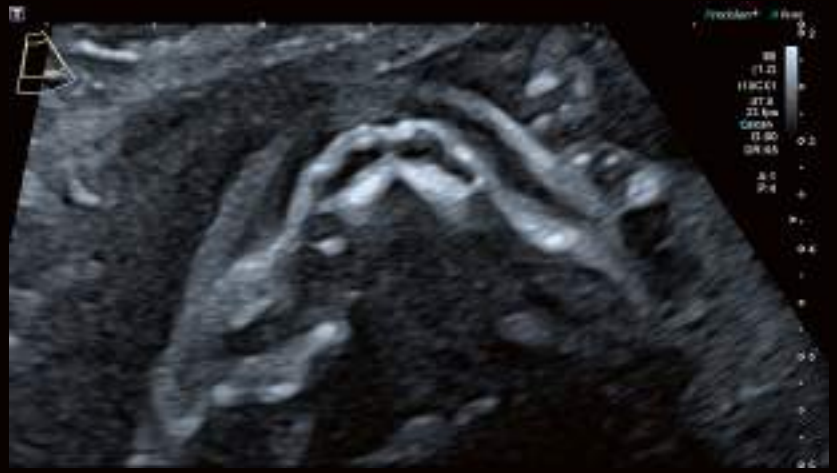
Coronal plane of the fetal head (Tübingen protocol)

Mid-sagittal fetal profile (ISUOG / DEGUM)

Fetal face

Coronal plane of the lips with intact upper lip, mouth, lower lip and nose
(ISUOG / AIUM / DEGUM / NHS-FASP)

Orbits (ISUOG / DEGUM) with lenses (Tübingen protocol)

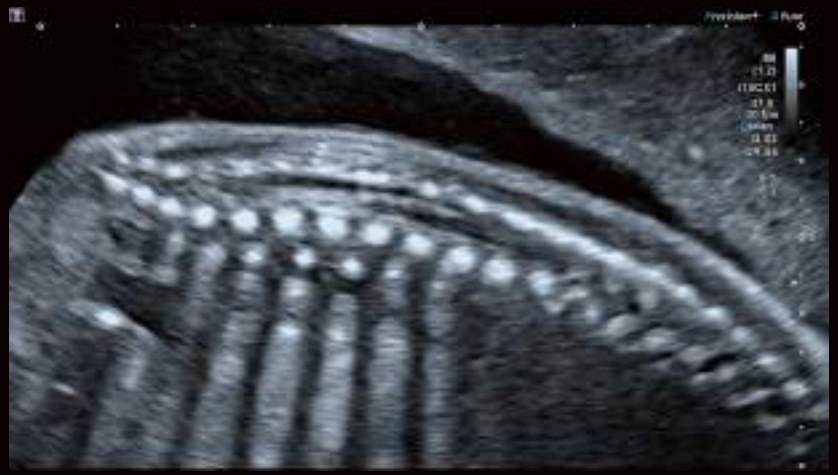


Hard palate (Tübingen protocol)

Fetal neck and spine

Transverse plane of the neck with the thyroid gland
(Tübingen protocol)

Sagittal image of the neck (ISUOG / AIUM / DEGUM / NHS-FASP)



Sagittal image of the spine with intact contour of the skin
(ISUOG / AIUM / DEGUM / NHS-FASP)

Fetal heart

Transverse planes of the upper abdomen with the stomach and the thorax
with the four chambers of the heart (ISUOG / AIUM / DEGUM / NHS-FASP)

Fetal heart and outflow tracts

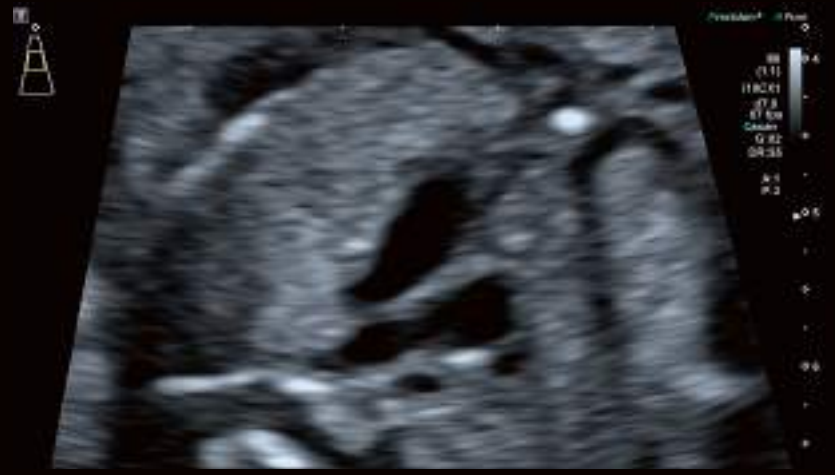
Transverse image of the thorax with the apical four chamber view of the heart and the lungs (ISUOG / AIUM / DEGUM / NHS-FASP)

Left ventricular outflow tract (ISUOG / AIUM / DEGUM / NHS-FASP)

Apical four chamber view of the heart in color Doppler (ISUOG encouraged, Tübingen protocol)

Left ventricular outflow tract in color Doppler (ISUOG encouraged, Tübingen protocol)

Right ventricular outflow tract (ISUOG / AIUM / DEGUM / NHS-FASP)



3-vessel view (ISUOG / AIUM / DEGUM / NHS-FASP)

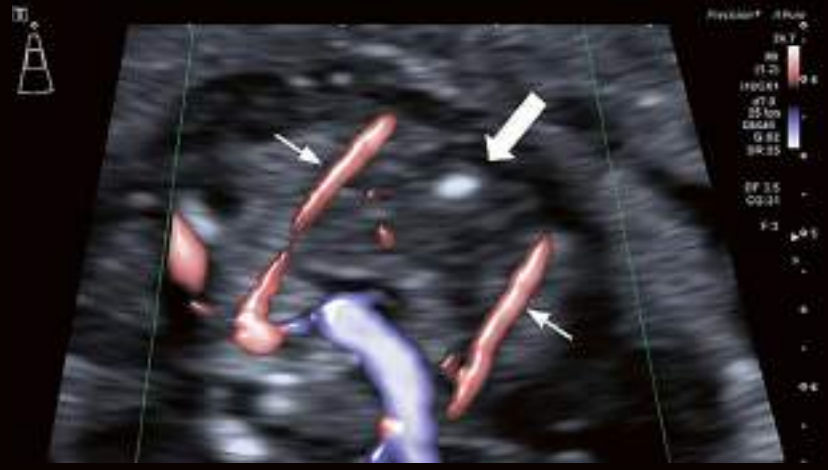
Right ventricular outflow tract in color Doppler
(ISUOG encouraged, Tübingen protocol)

3-vessel view in color Doppler
(ISUOG encouraged, Tübingen protocol)

Venous system and thymus

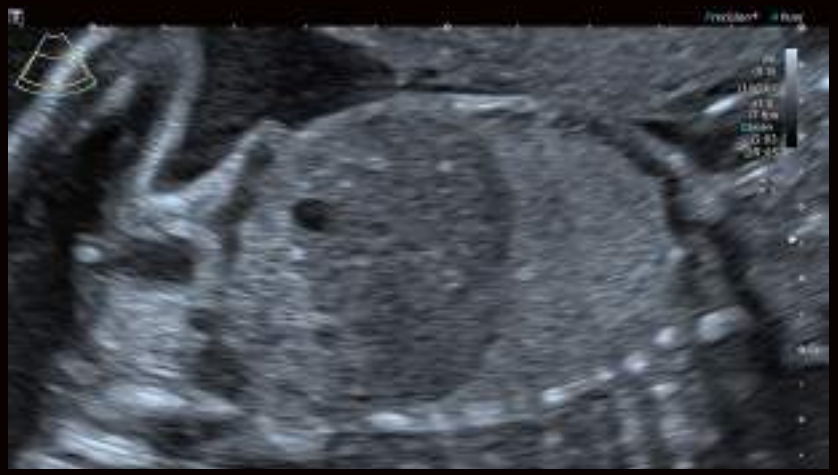
Pulmonary veins in color Doppler (Tübingen protocol)

Inferior vena cava in color Doppler (Tübingen protocol)



The thymus (block arrow) between the two internal mammary arteries (arrows) (Tübingen protocol)

Fetal abdomen



Para-sagittal body image with the right diaphragm (ISUOG / DEGUM)

Para-sagittal body image with the left diaphragm (ISUOG / DEGUM)

Transverse image of the abdominal circumference with stomach in normal position (ISUOG / AIUM / DEGUM / NHS-FASP)

Umbilical arteries and abdomen

Insertion of the umbilical cord with intact abdominal wall
(ISUOG / AIUM / DEGUM)

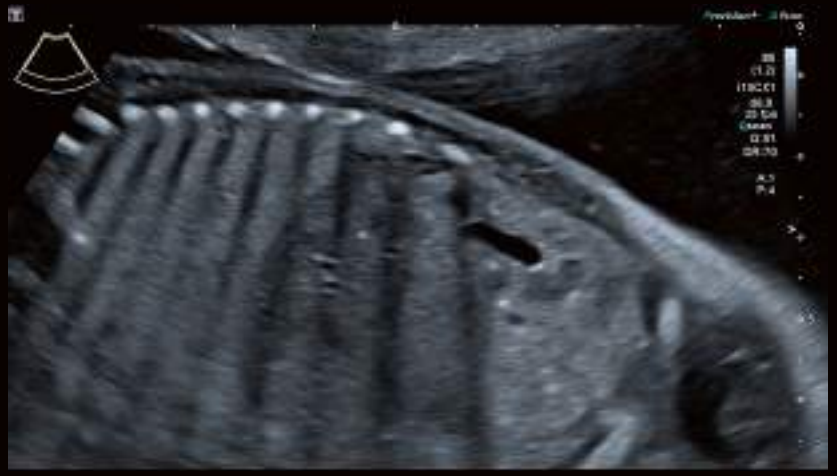
Gallbladder (arrow) (ISUOG)

Bladder with both umbilical arteries (ISUOG / AIUM / DEGUM)

Fetal kidneys

Transverse plane of the kidneys showing both renal pelvises
(ISUOG / AIUM / DEGUM)

Sagittal view of the left kidney (Tübingen protocol)



Sagittal view of the right kidney (Tübingen protocol)

Lower extremities

Femur (ISUOG / AIUM / DEGUM / NHS-FASP)

Frontal view of the shin with tibia and fibula (DEGUM)

Leg with tibia and correct angle of the talocrural joint
(ISUOG / AIUM / DEGUM)

Foot (ISUOG / AIUM / DEGUM)

Upper extremities

Shoulder and humerus (ISUOG / AIUM / DEGUM)

Forearm with radius and ulna (DEGUM)

Hand (ISUOG / AIUM / DEGUM)

External genitalia

Female genitalia (ISUOG recommended, for checking normal appearance)

Male genitalia (ISUOG recommended, for checking normal appearance)

ISUOG GOOD PRACTICE POINT[4]

Characterization of external genitalia to determine fetal gender is not considered part of the routine mid-trimester scan. Reporting of gender should be considered only on parental request and in the context of local practice and regulations. However, the normal appearance of the external genitalia should be checked.

Feto-maternal system

Transabdominal view of the cervix and placenta (ISUOG)

Placental insertion of the umbilical cord (ISUOG, DEGUM)

Uterine artery (Tübingen protocol)

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