Ultrazvuk v rukou porodnického anesteziologa

Jaroslava Ščamburová

Ústav pro péči o matku a dítě Praha- Podolí

K danému tématu nemám žádný konflikt zájmů.

Použití ultrazvuku

- Kanylace cévního řečiště.
- Ultrazvuk hrudníku – srdce.
- Airway management - vyšetření před předpokladem obtížného zajištění DC.
- Neuroaxiální blokády – centrální.
- Vyšetření antra - riziko aspirace.

The Use of Ultrasonography in Obstetric Anesthesia

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KEYWORDS

• Ultrasound • Ultrasonography • Anesthesia • Obstetric

KEY POINTS

- Some national guidelines advocate the placement of central vascular access with ultrasonography when possible, and this applies to the obstetric cohort, who may otherwise be technically difficult because of body habitus and edema.
- Pre-procedural spinal ultrasonography assessment facilitates the placement of neuraxial anesthesia, and national guidelines for ultrasonography-assisted epidural catheter placement have been issued. It reduces the number of attempts, ensures a higher success rate, and is helpful for predicted difficult insertions, such as in obese individuals and those with scoliosis.
- Many clinical situations in obstetrics call for urgent interventions, when fasting status is unclear. Gastric ultrasound provides a qualitative and quantitative assessment of the gastric content, and may be useful in estimating perioperative aspiration risk.
- Lung ultrasound is a novel concept in the obstetric population, but it is well-established in the critical care setting. It is particularly useful in diagnosing pulmonary edema, and the consequent progression or resolution of the disease process. Its role in severe pre-eclampsia and heart failure may be advantageous, especially without the concerns of ionizing radiation that are present in current imaging tools.

Anesthesiol Clin. 2017 Mar;35(1):35-58. doi: 10.1016/j.anclin.2016.09.005.

Recommendations on the Use of Ultrasound Guidance for Adult Lumbar Puncture: A Position Statement of the Society of Hospital Medicine

Published online first June 10, 2019. DOI 10.12788/jhm.3197

By: Nilam J Soni, MD, MS, Ricardo Franco-Sadud, MD, Ketino Kobaidze, MD, PhD, Daniel Schnobrich, MD, Gerard Salame, MD, Joshua Lenchus, DO, Venkat Kalidindi, MD, Michael J Mader, MS, Elizabeth K Haro, MPH, Ria Dancel, MD, Joel Cho, MD, RDMS, RDCS, Loretta Grikis, MLS, the SHM Point-of-care Ultrasound Task Force, Brian P Lucas, MD, MS

ELSEVIER

Best Practice & Research Clinical Anaesthesiology

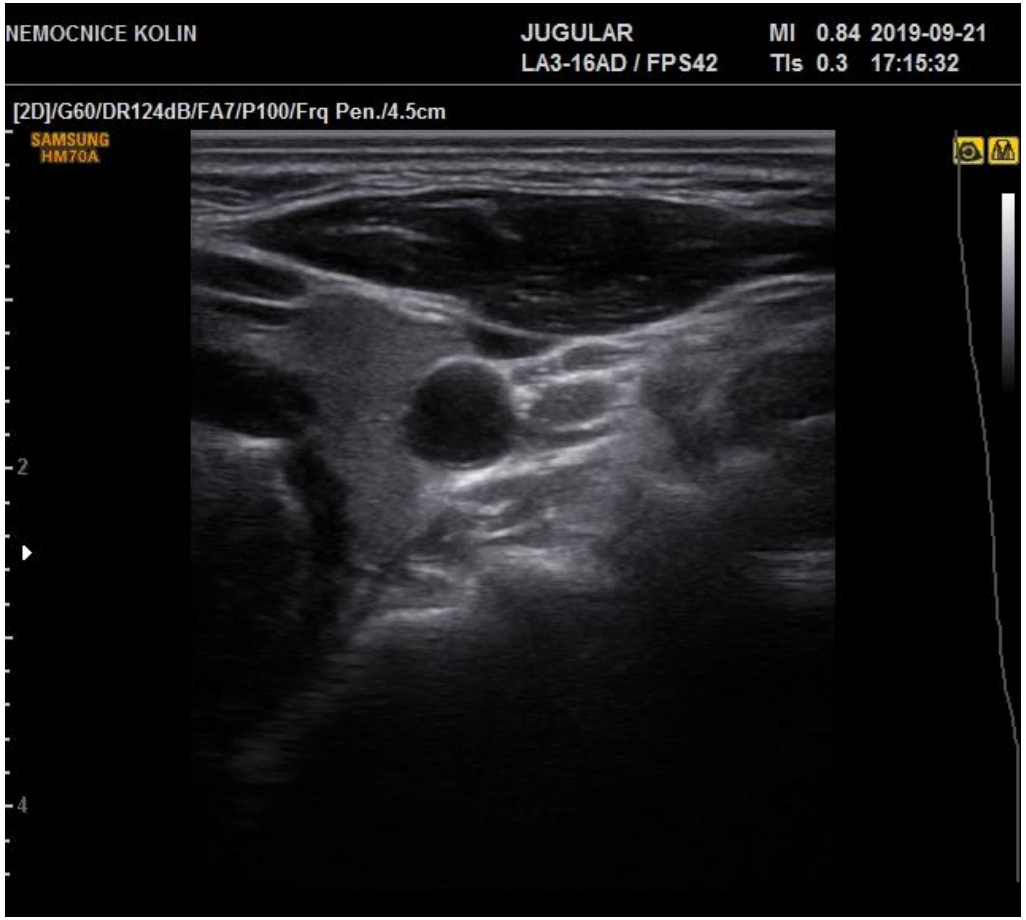
Volume 31, Issue 1, March 2017, Pages 81-90

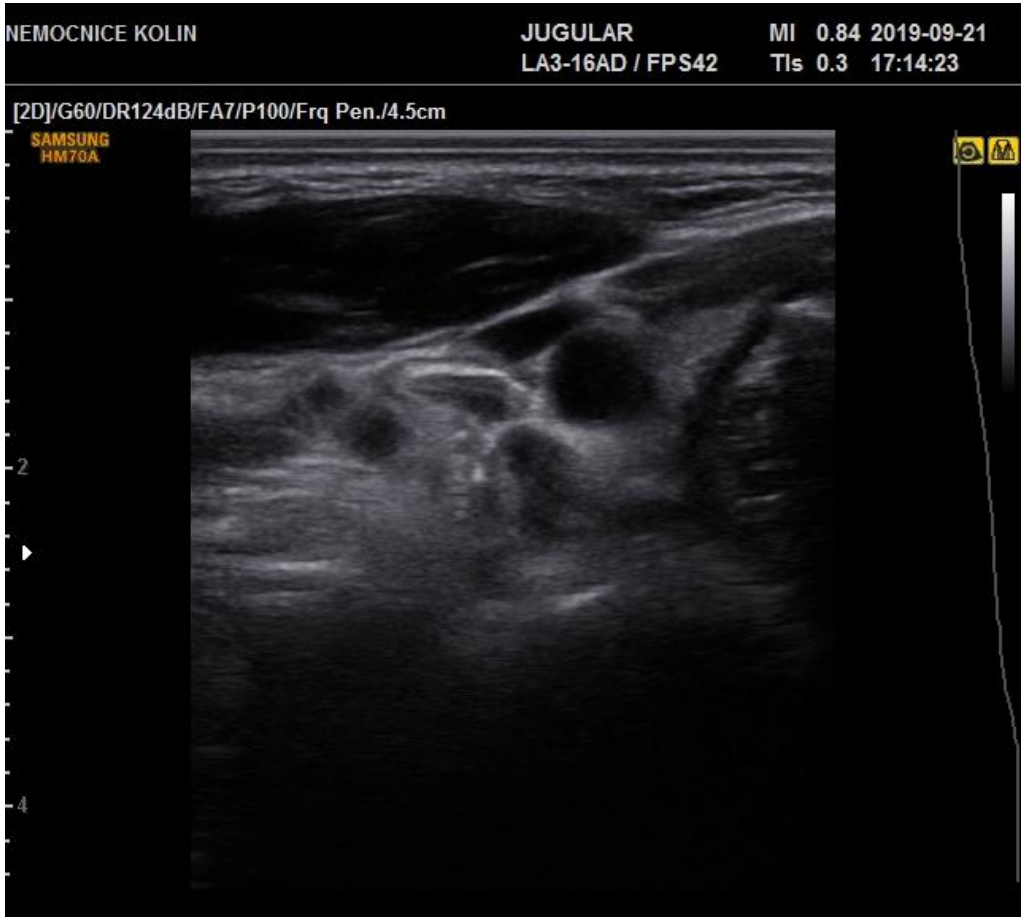
8

The role of ultrasonography in obstetric anesthesia

Allison Lee MD (Assistant Professor of Anesthesiology) [a], John P.R. Loughrey FCAI, FFPMCAI (Consultant Anaesthetist) [b, 1]

Centrální žilní systém





Airway management

- U těhotných 10x častější obtížné zajištění DC.
- UZ může upřesnit polohu cricothyroidální membrány.
- U obézních pacientek může upřesnit vzdálenost ve které je cricothyroidální membrána od kůže.
- Výhoda u předpokládaného obtížného zajištění DC.
- Menší riziko iatrogenního poranění zadní stěny trachey.

BJA

British Journal of Anaesthesia, 120 (5): 1033–1039 (2018)

doi: 10.1016/j.bja.2018.02.010
Advance Access Publication Date: 21 March 2018
Obstetrics

OBSTETRICS

Relationship between severe obesity and depth to the cricothyroid membrane in third-trimester non-labouring parturients: a prospective observational study

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This article is accompanied by an editorial: Front of neck: continued discovery of this anatomy essential for airway management by Kristensen & Teoh, *Br J Anesth* 2018:120:895-898, doi: 10.1016/j.bja.2018.02.015.

Abstract

Background: Severely obese parturients have increased 'cannot intubate, cannot oxygenate' risk during Caesarean section under general anaesthesia. Front-of-neck access (FONA) at the cricothyroid membrane (CTM) is definitive management; however, attempted FONA can fail. Point-of-care ultrasonography may provide useful information about CTM depth to aid FONA in obesity. This study determined the difference in CTM depth between severely obese and non-obese parturients, utilising ultrasonography.

Methods: In this prospective observational study, two anaesthetists performed airway ultrasonography on 15 severely obese (BMI >45 kg m^{-2}) and 15 normal-weight (BMI ≤25 kg m^{-2}) parturients in the third trimester, using the transverse and longitudinal planes, sniffing and extended head positions, and nil and firm transducer pressures. The primary outcome was CTM depth (millimetres) measured in the transverse plane with the head extended and nil transducer pressure. Secondary outcomes included CTM depth measurements using other factor configurations. Intra-class correlation coefficients assessed the inter-observer reliability.

Results: CTM depth measured in the transverse plane with head extended and nil transducer pressure was significantly greater in severely obese parturients, mean 18.0 mm (95% confidence interval 16.3–19.8), *vs* 10.6 mm (8.81–12.4) in non-obese ($P<0.001$); mean difference 7.4 mm (4.9–9.9; $P<0.001$). CTM depths were increased in the severely obese group regardless of scanning plane, head and neck position, or transducer pressure (all $P<0.001$). There was excellent inter-observer reliability.

Conclusions: Cricothyroid membrane depth is significantly increased in severely obese *vs* normal-weight parturients independently of scanning plane, head and neck position, or transducer pressure.

Keywords: airway management; intubation; oxygen inhalation therapy; pregnancy; ultrasonography

British Journal of Anaesthesia, 120 (5): 1033e1039 (2018)

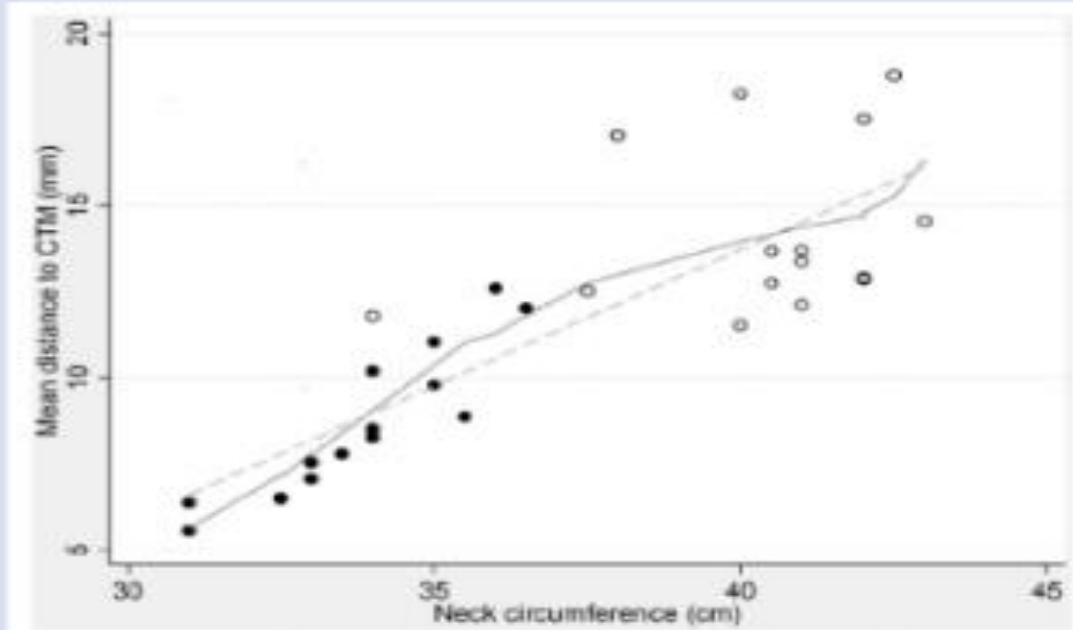


Fig 4. Scatter plot of cricothyroid membrane depth (mm) and neck circumference (cm), with both the linear fit and LOWESS curve shown, correlation coefficient r=0.8408 (95% CI 0.71–0.92). Solid dots are normal-weight parturients; hollow dots are severely obese parturients. CTM, cricothyroid membrane; LOWESS, locally weighted scatter-plot smoothing.

Table 1 Baseline characteristics of normal-weight (n=15) and severely obese (n=15) parturients in their third trimester. Values are mean (SD). SD, standard deviation

Variable	Normal weight, BMI ≤25 kg m^{-2}		Severe obesity, BMI >45 kg m^{-2}	
	Mean (SD)	Range	Mean (SD)	Range
Age (yr)	29.5 (5.4)	19–25	28.8 (5.5)	20–39
Gestation (weeks)	32.2 (2.3)	30–37	33.8 (2.5)	30–39
Weight (kg)	56.4 (8.1)	44–71	132.8 (17.1)	113–166
BMI (kg m^{-2})	21.5 (1.8)	19–25	50.8 (3.3)	46–57

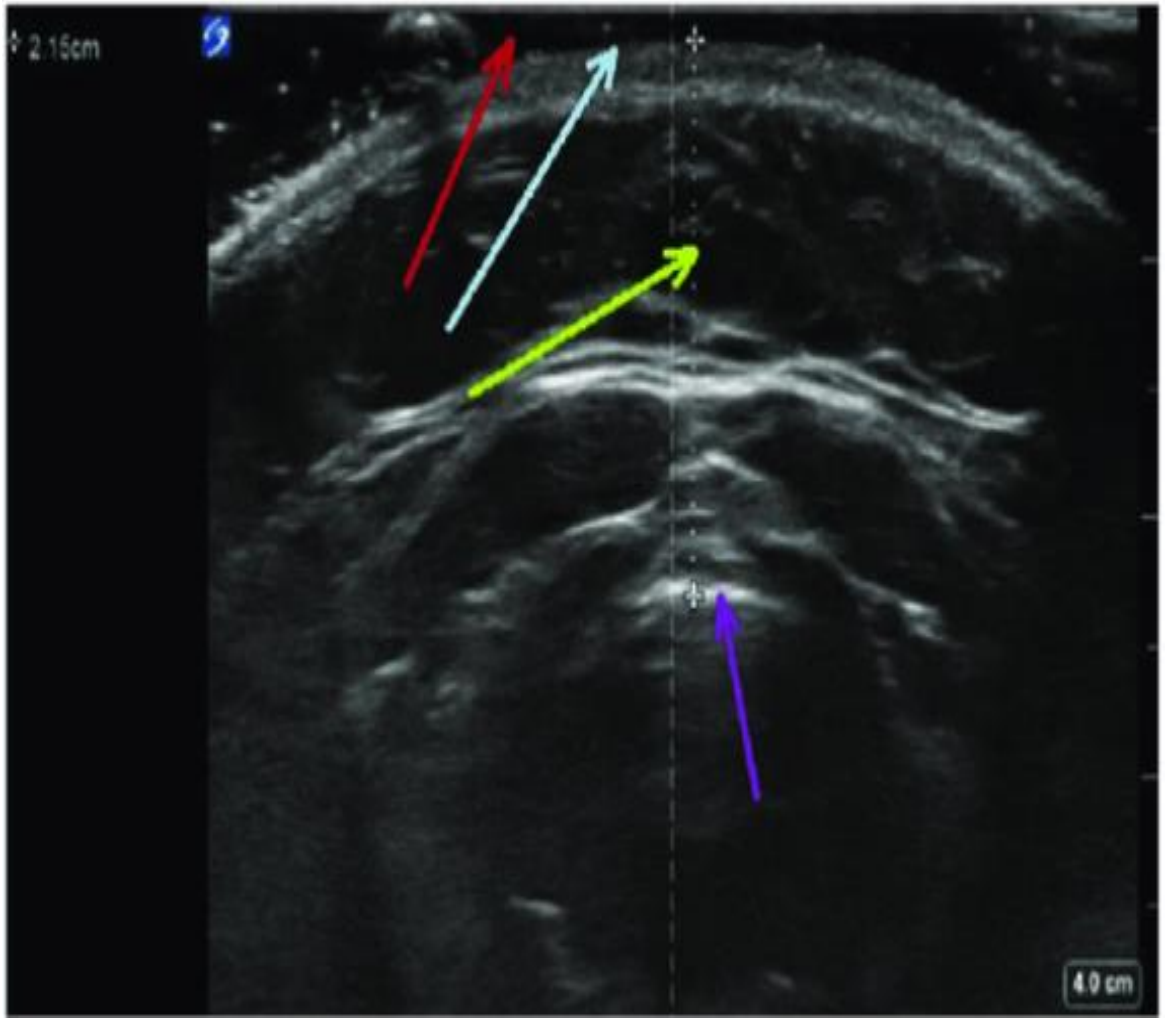
British Journal of Anaesthesia, 120 (5): 1033e1039 (2018)

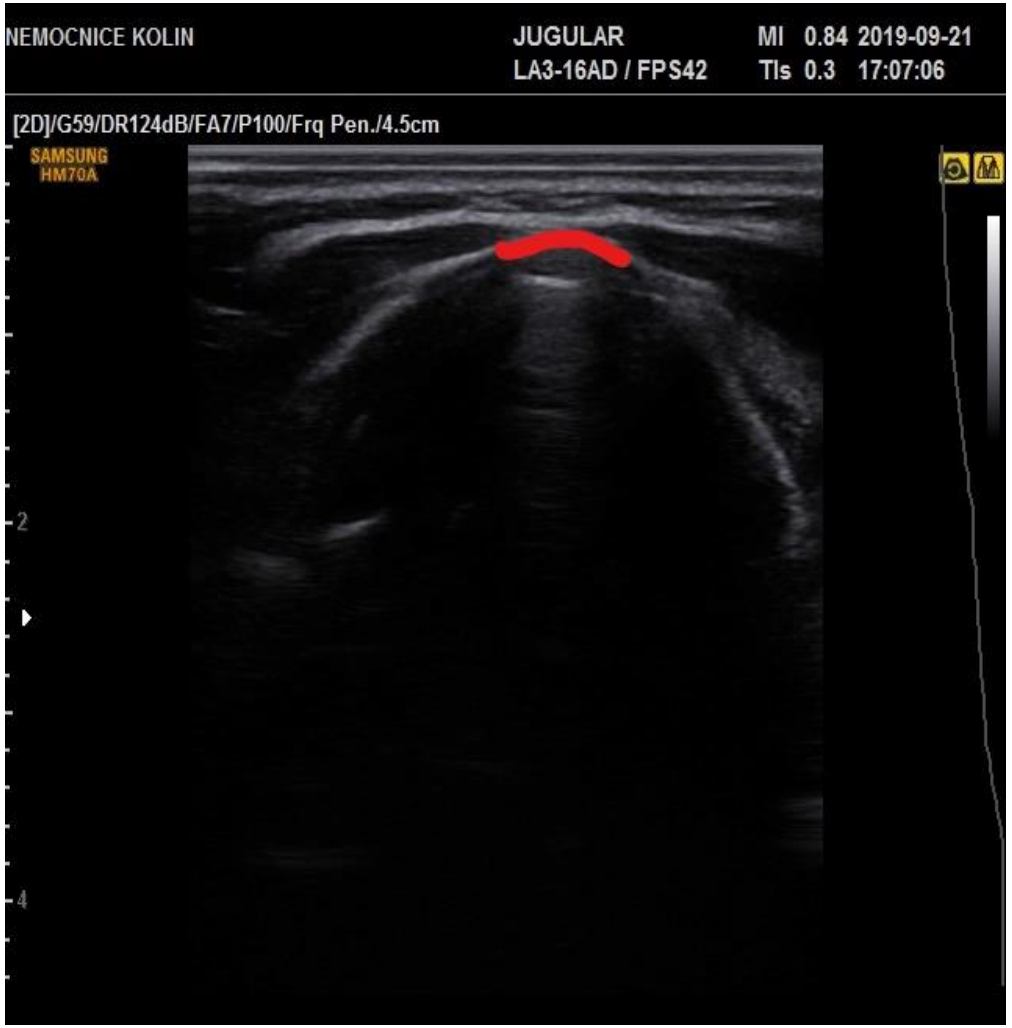
Table 2 Intra-class correlation coefficients with 95% CIs, and estimated means and differences with 95% CIs, for cricothyroid membrane depths and lengths for severely obese (n=15) and normal-weight parturients (n=15)

	Inter-rater reliability		Normal weight, BMI ≤25 kg m^{-2}		Severe obesity, BMI >45 kg m^{-2}		Difference between BMI groups		
	ICC	(95% CI)	Mean (mm)	(95% CI)	Mean (mm)	(95% CI)	Mean (mm)	(95% CI)	P-value
Transverse plane									
Nil transducer pressure									
Airway in extended position	0.98	(0.95–0.99)	10.6	(8.8–12.4)	18.0	(16.3–19.8)	7.4	(4.9–9.9)	<0.001
Airway in sniffing position	0.89	(0.79–0.95)	10.9	(9.4–12.4)	17.7	(16.2–19.2)	6.8	(4.6–9.0)	<0.001
Firm transducer pressure									
Airway in extended position	0.86	(0.68–0.93)	6.1	(5.2–7.1)	9.6	(8.7–10.5)	3.4	(2.1–4.7)	<0.001
Airway in sniffing position	0.92	(0.80–0.96)	6.0	(5.1–6.9)	9.5	(8.7–10.4)	3.5	(2.3–4.8)	<0.001
Longitudinal (extended position)									
Nil transducer pressure									
Proximal point of CTM	0.98	(0.95–0.99)	11.2	(9.6–12.8)	16.4	(14.8–18.0)	5.2	(3.0–7.4)	<0.001
Midpoint of CTM	0.99	(0.98–0.995)	10.6	(9.2–12.1)	17.0	(15.5–18.5)	6.4	(4.3–8.4)	<0.001
Distal point of CTM	0.99	(0.98–0.995)	10.4	(9.0–11.9)	18.5	(17.0–19.9)	8.1	(6.0–10.1)	<0.001
Length of CTM	0.63	(0.10–0.84)	9.1	(8.5–9.7)	9.4	(8.8–10.0)	0.3	(−0.6 to 1.2)	0.488
Firm transducer pressure									
Proximal point of CTM	0.97	(0.94–0.99)	7.6	(6.5–8.7)	12.5	(11.4–13.5)	4.9	(3.4–6.4)	<0.001
Midpoint of CTM	0.98	(0.95–0.99)	7.0	(5.8–8.1)	12.3	(11.2–13.4)	5.3	(3.7–6.9)	<0.001
Distal point of CTM	0.96	(0.92–0.98)	6.5	(5.2–7.8)	12.0	(10.7–13.3)	5.5	(3.7–7.4)	<0.001
Length of CTM	0.60	(0.19–0.81)	9.3	(8.5–10)	9.9	(9.2–10.6)	0.6	(−0.4 to 1.7)	0.244

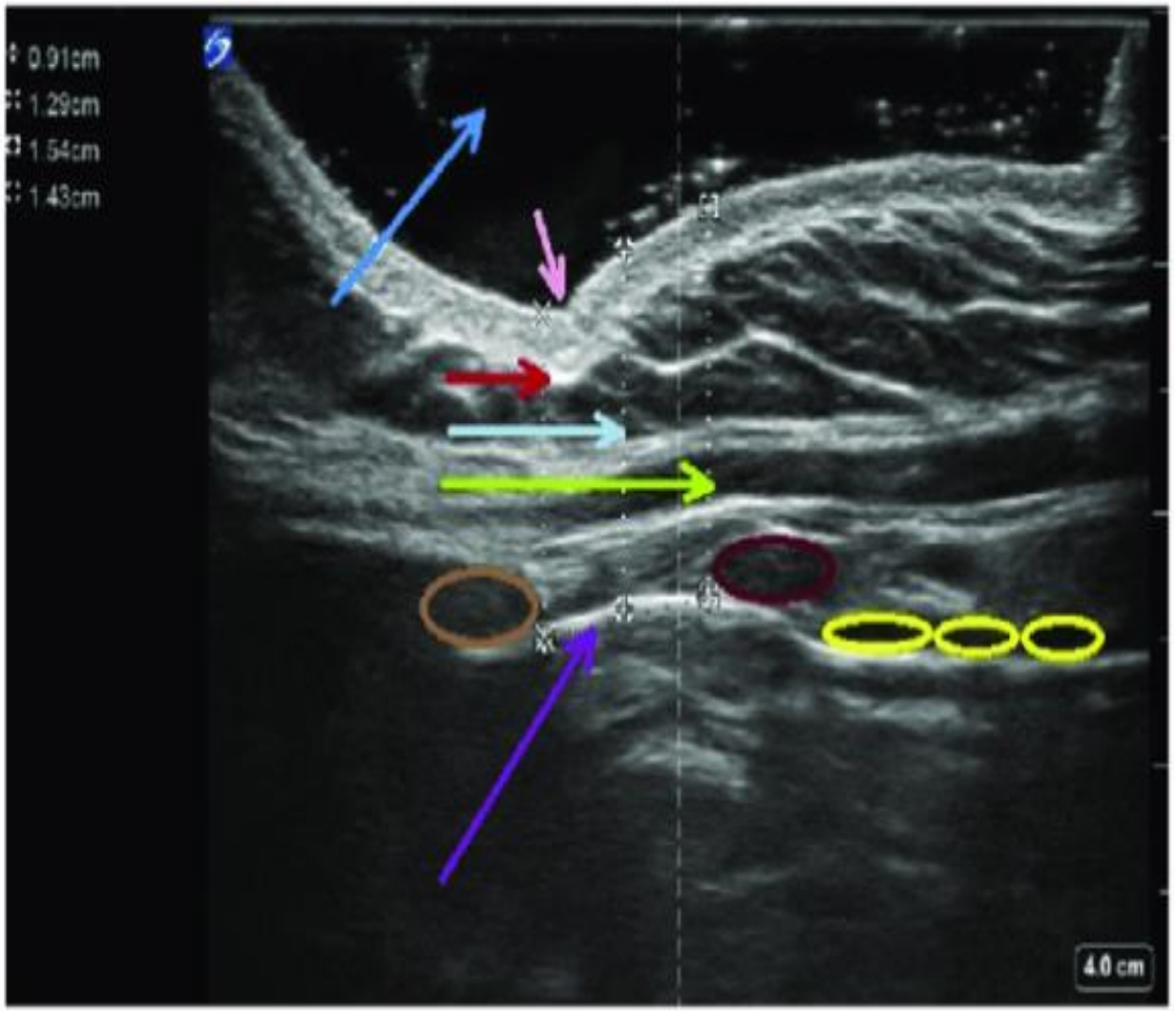
CI, confidence interval; CTM, cricothyroid membrane; ICC, intra-class correlation coefficient.

British Journal of Anaesthesia, 120 (5): 1033e1039 (2018)





BJA British Journal of Anaesthesia
120(5) · March 2018



BJA British Journal of Anaesthesia
120(5) · March 2018

BMI > 30 kg.m−2

The use of pre-operative or pre-procedural ultrasound identification of the cricothyroid membrane may be an important strategy for airway management

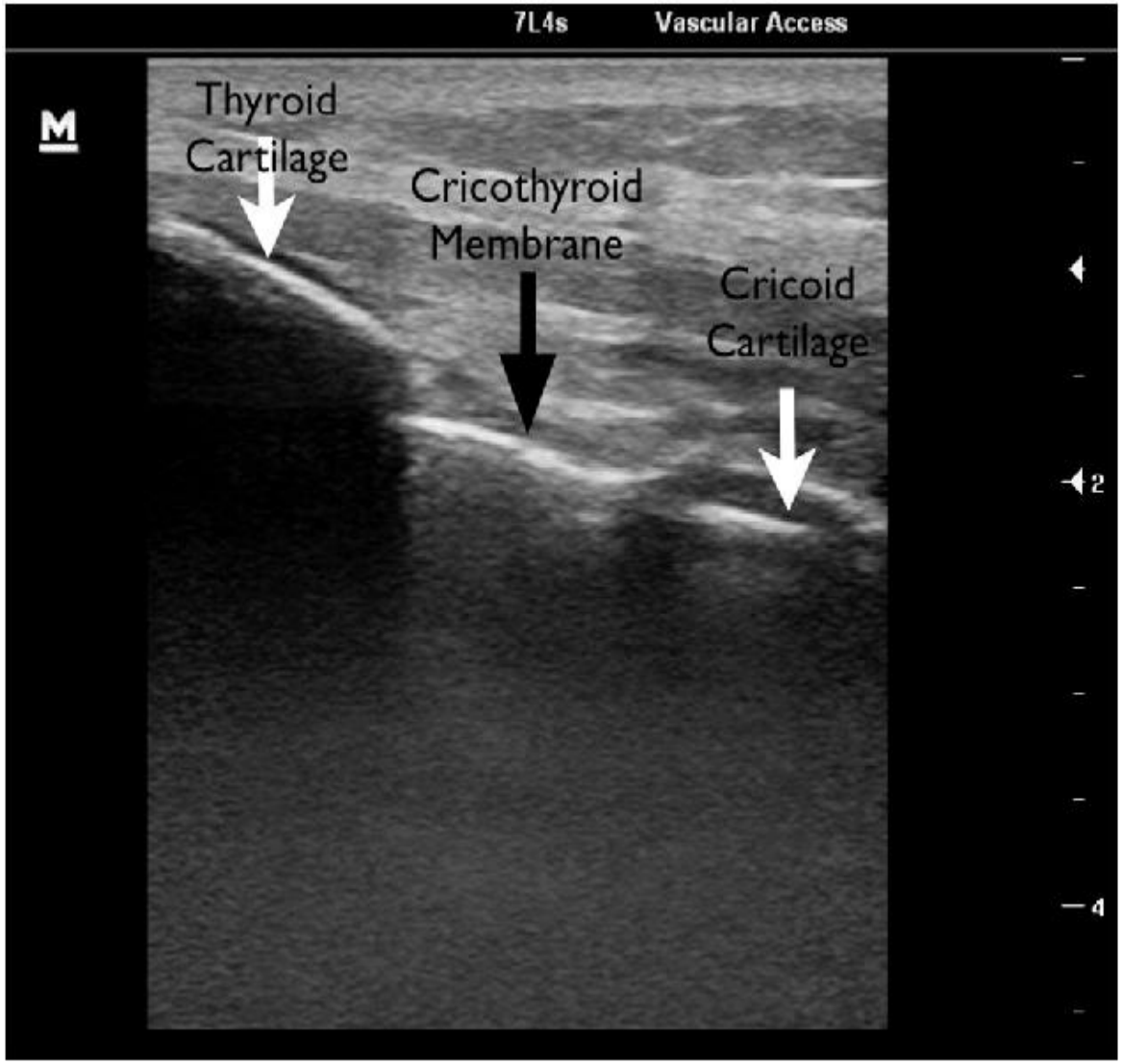
- While our findings demonstrated that ultrasound can accurately identify the cricothyroid membrane in obese patients, several other potential errors can be introduced before a cricothyroidotomy is successfully performed; these include different techniques and devices used, prior training and skill retention. In conclusion, ultrasonography should become an important component of the training of clinicians involved in airway management.

Table 3. Accuracy of digital palpation of the cricothyroid membrane. Values are median (IQR [range]), number (proportion) or number (95% CI)

	Obese (n = 28)	Non-obese (n = 28)	p value
Time taken to palpate cricothyroid membrane; s	23 (13–25 [10–75])	12 (9–22 [3–71])	0.01
Total no. of attempts			
1	20 (71%)	22 (79%)	0.76
2	8 (29%)	6 (21%)	
US-DP distance; mm	5 (2–9.5 [0–34])	1.8 (0.1–6 [0–15])	0.02
Accuracy of digital palpation[a]	11 (39%)	20 (71%)	0.03
Odds ratio for accuracy		3.9 (1.3–11.8)	0.02

Non-obese, BMI < 30 $kg.m^{-2}$; Obese, BMI ≥ 30 $kg.m^{-2}$.

[a] Defined as digital palpation mark ≤ 4 mm of the ultrasound mark.



*BMC Emergency Medicine***volume 18**,
Article number: 5 (2018)

TTE v rukou anesteziologa

Akutní, rychlé vyšetření.

- Funkční stav, kinetika.
- Velikost srdečních oddílů.
- Stav objemové náplně :

Preeklampsie

Hemoragie

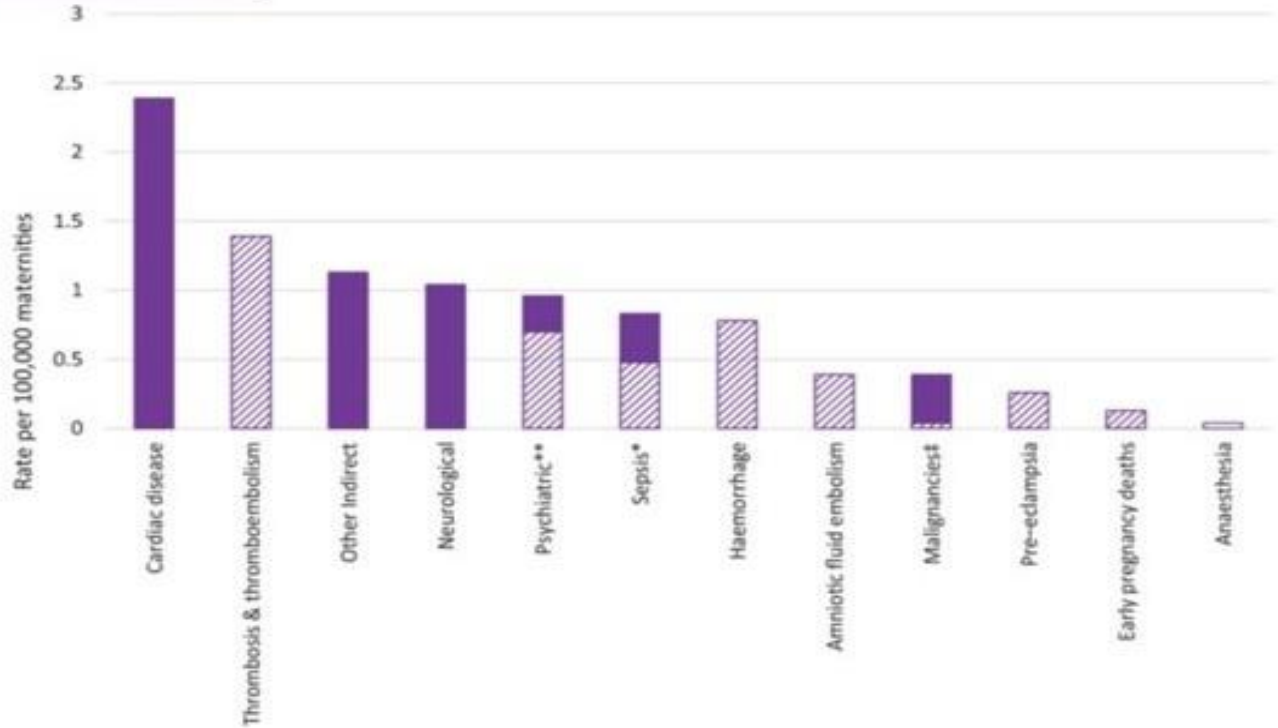
Sepse

Figure 1. Parasternal long axis grade one view. LV: left ventricle, RV: right ventricle, LA: left atrium, AoR: aortic root, MV: mitral valve, AV: aortic valve.

Causes of maternal death 2014-16

In 2014-16 **9.8** women per 100,000 died during pregnancy or up to six weeks after childbirth or the end of pregnancy.

Most women who died had multiple health problems or other vulnerabilities.



MBRRACE-UK

The Use of Transthoracic Echocardiography in Postpartum Hypotension

Alicia Dennis;Amber Stenson;

- Author Information

From the Departments of *Anaesthesia and †Pharmacology, The Royal Women's Hospital, and The University of Melbourne, Parkville, Victoria, Australia.

Anesthesia & Analgesia. 115(5):1033–1037, NOVEMBER 2012
DOI: 10.1213/ANE.0b013e31826cde5f , PMID: 23051881
Issn Print: 0003-2999
Publication Date: November 2012

Focused transthoracic echocardiography in obstetrics

S. Griffiths;G. Waight;A. Dennis;

Anesthesia & Analgesia. 115(5):1033–1037, NOVEMBER 2012
DOI: 10.1213/ANE.0b013e31826cde5f , PMID: 23051881
Issn Print: 0003-2999
Publication Date: November 2012

The Effect of Obesity on TTE Imaging During Pregnancy

Emily C. Williamson, M.D., Kenneth E. Nelson, M.D.

Department of Obstetric Anesthesiology, Wake Forest School of Medicine

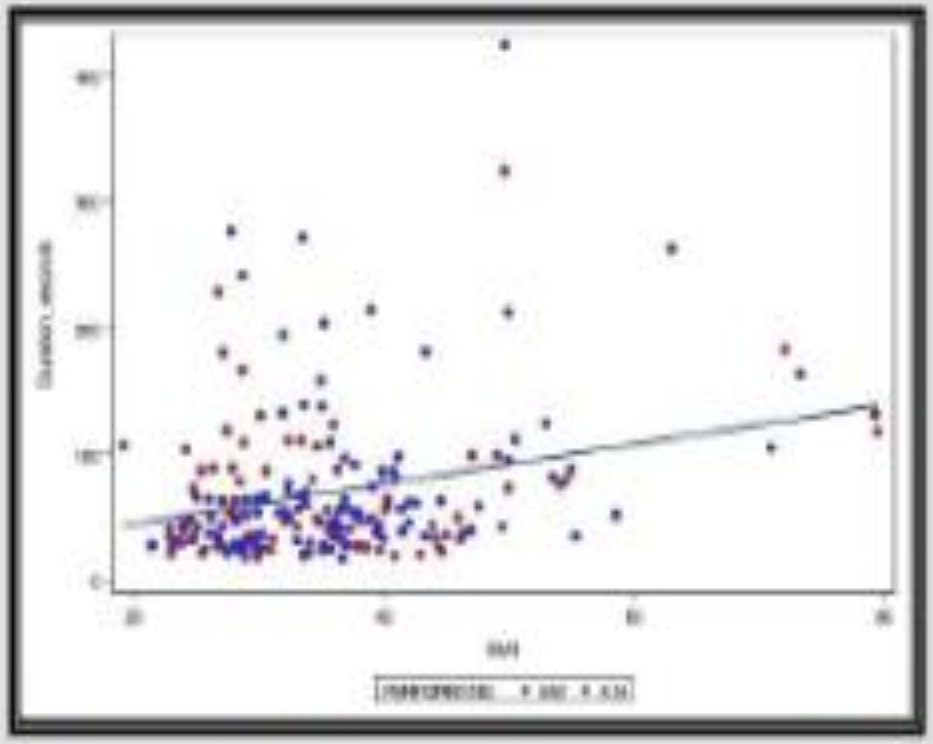


Figure 2. Association of BMI with study duration, all data: each unit increase in BMI, study duration increased by 1.57 seconds (95% CI 0.78 to 2.36) p=0.0001.

TTE u těhotných

- Přesná neinvazivní metoda umožňuje časné zahájení a optimalizaci terapie v peri a pooperačním období.
- Dobrá vyšetřitelnost v parasternální dlouhé ose bez limitace děložním fundem.
- Nepříznivé anatomické poměry v subkostální a apikální projekci – nepohodlné pro pacientky.
- Rychlé vyšetření umožňuje časné zahájení a optimalizaci terapie.

Figure 1. Parasternal long axis grade one view. LV: left ventricle, RV: right ventricle, LA: left atrium, AoR: aortic root, MV: mitral valve, AV: aortic valve.

Centrální neuroaxiální blokády

- Anatomie
- Ultrazvuková anatomie
- Volba sondy - nastavení přístroje

Neuroaxiální blokády

International Journal of Obstetric Anesthesia
Volume 28, December 2016, Pages 12-16

Original Article

Ultrasound to identify the lumbar space in women with impalpable bony landmarks presenting for elective caesarean delivery under spinal anaesthesia: a randomised trial

M. Creaney, D. Mullane, C. Casby, T. Tan

Show more

https://doi.org/10.1016/j.ijoa.2016.07.007

Highlights

- Ultrasound and palpation were compared to identify the insertion point for spinal anaesthesia in parturients with impalpable lumbar spines.
- Pre-procedural ultrasound significantly reduced the number of needle redirections.
- Pre-procedural ultrasound did not prolong overall procedural time.

DSJUOG

10.5005/jp-journals-10009-1333

REVIEW ARTICLE

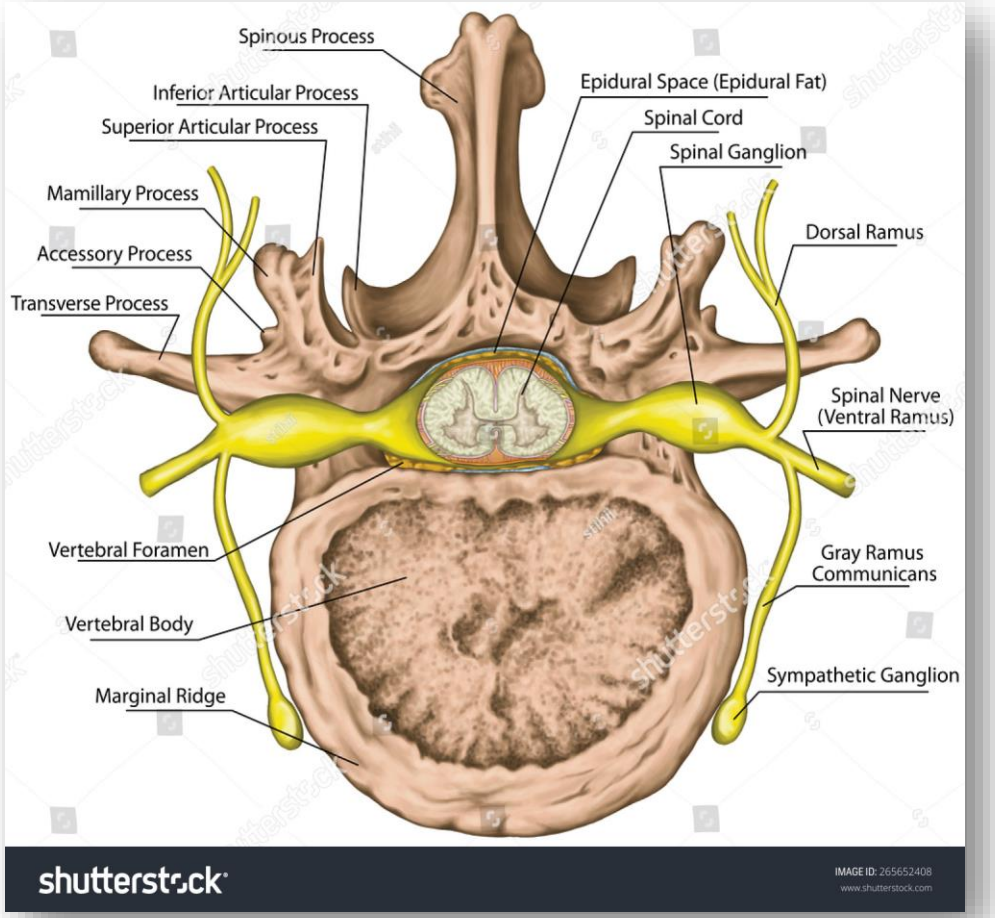
The Use of Ultrasonography for the Guidance of Epidural Analgesia in Obstetric Anesthesia

[1]Hana Teissler, [2]Claudia Lozano, [3]Sanja Kupesic Plavsic

Výhody použití UZ u neuroaxiálních blokád

- Komfort pro pacientky - minimalizace počtu pokusů.
- Volba optimálního místa u obézních.
- Definice hloubky zavedení.
- Snížení rizika nechtěné punkce dury.
- Snížení rizika postpunkční cefaley.
- Snížení rizika poranění – parestezie, spinální hematom.
- Užitečný při nepříznivých anatomických poměrech.
- Neprodlužuje zásadně délku provedení.

Anatomie



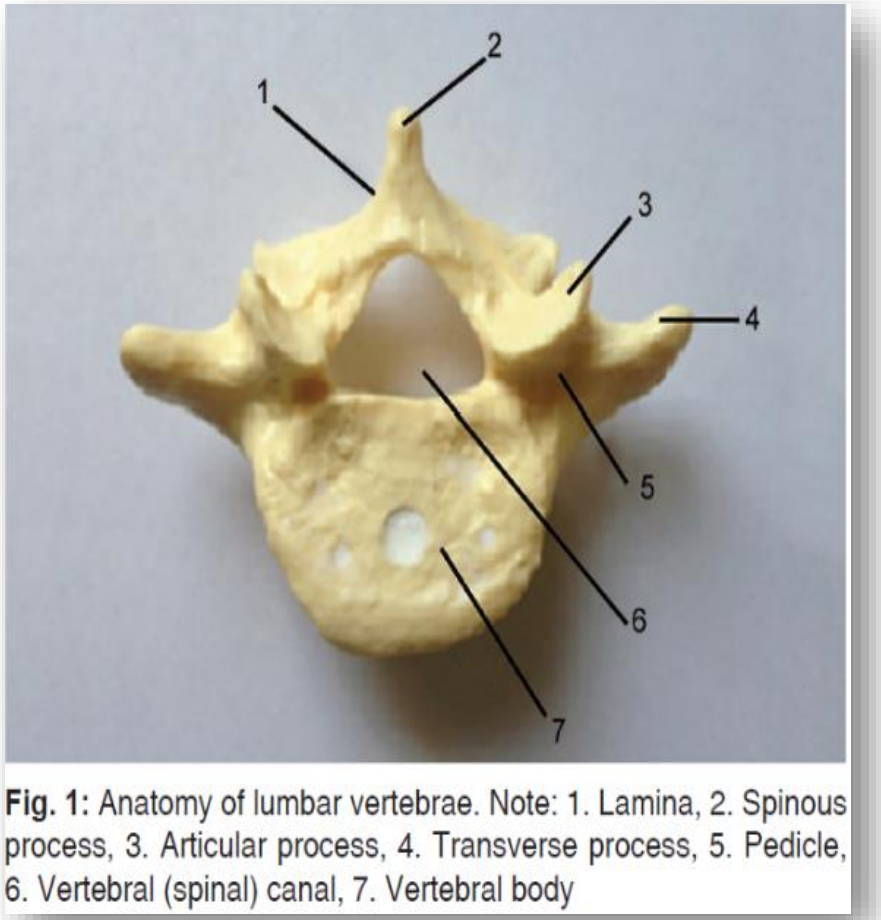


Fig. 1: Anatomy of lumbar vertebrae. Note: 1. Lamina, 2. Spinous process, 3. Articular process, 4. Transverse process, 5. Pedicle, 6. Vertebral (spinal) canal, 7. Vertebral body

Anatomie

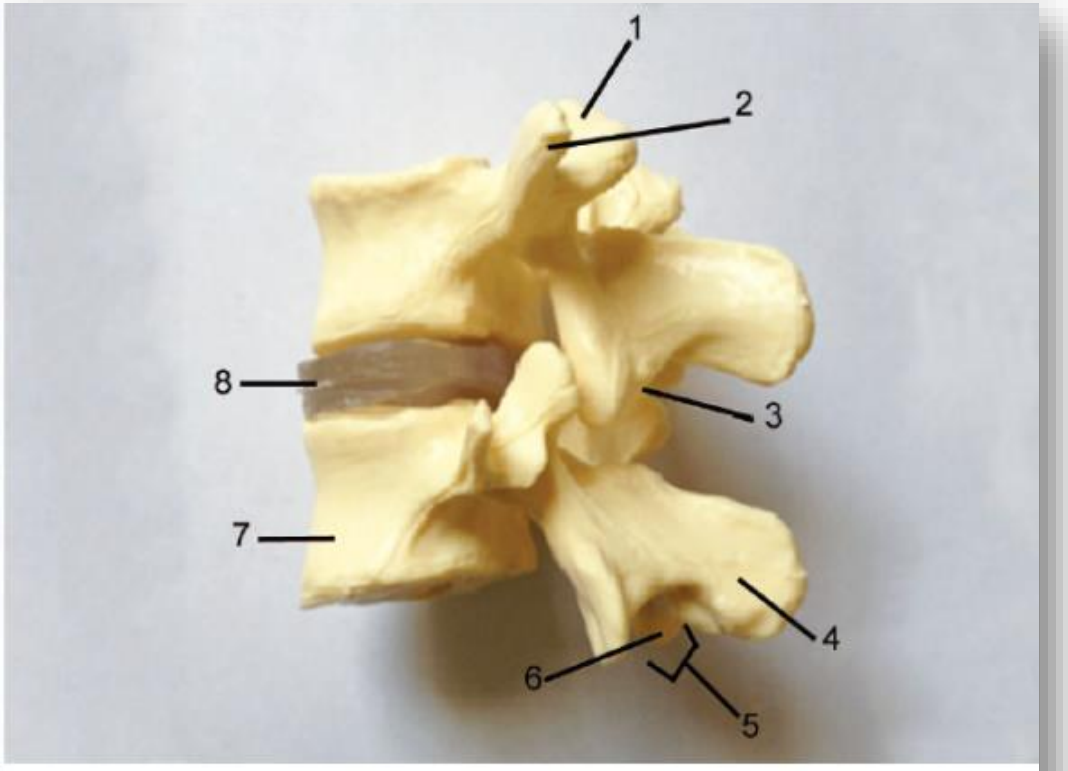
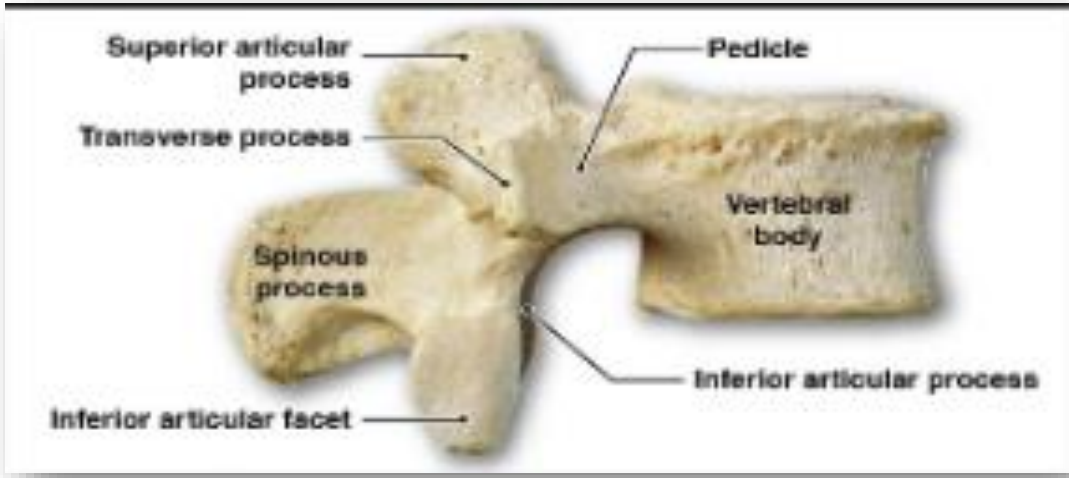
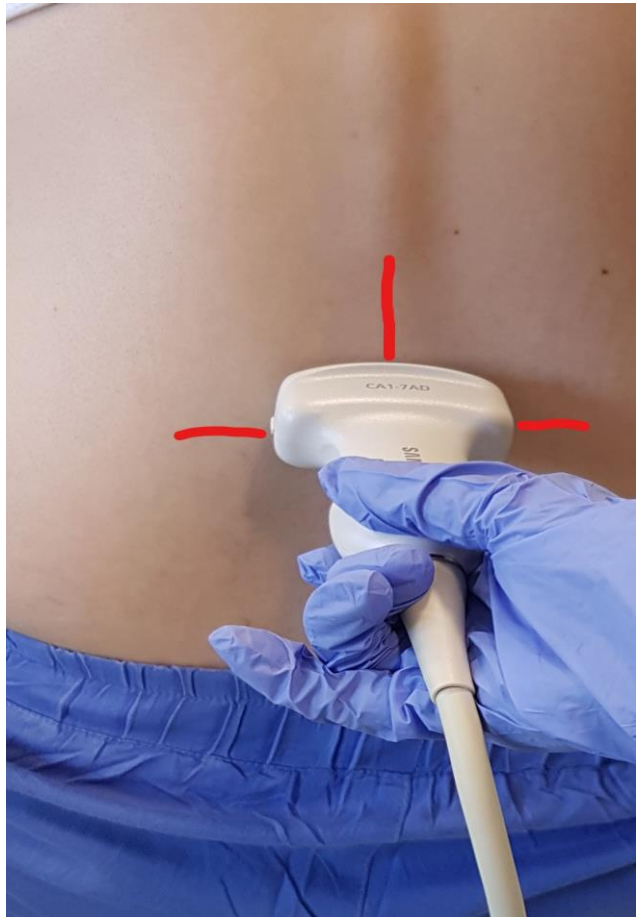


Fig. 2: Anatomy of lumbar vertebrae. Note: 1. Articular process (upper), 2. Transverse process, 3. Facet joint, 4. Spinous process, 5. Articular process (lower), 6. Facet, 7. Vertebral body, 8. Disk

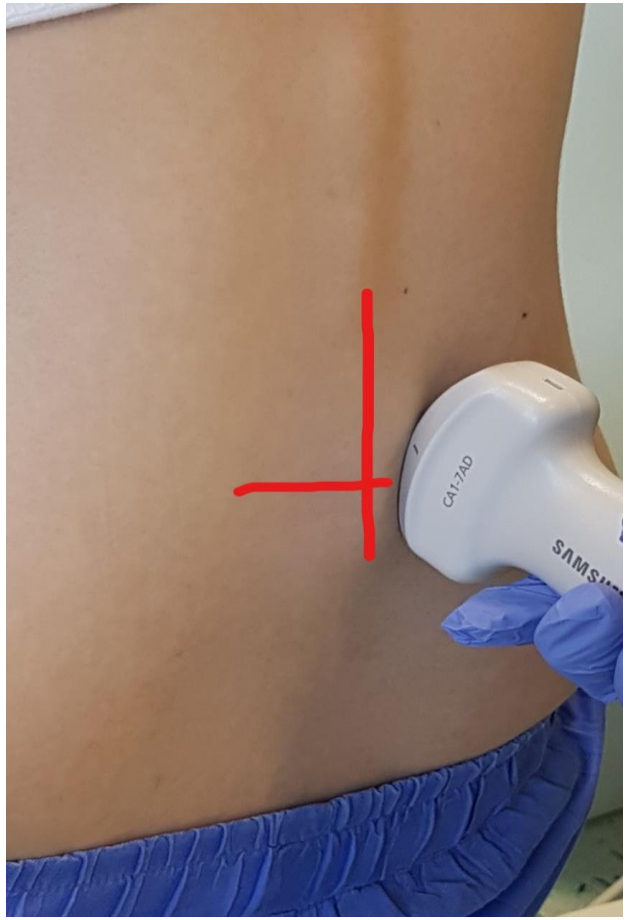


Grau T, Leipold RW, Conradi R, Martin E. Ultrasound control for presumed difficult epidural puncture

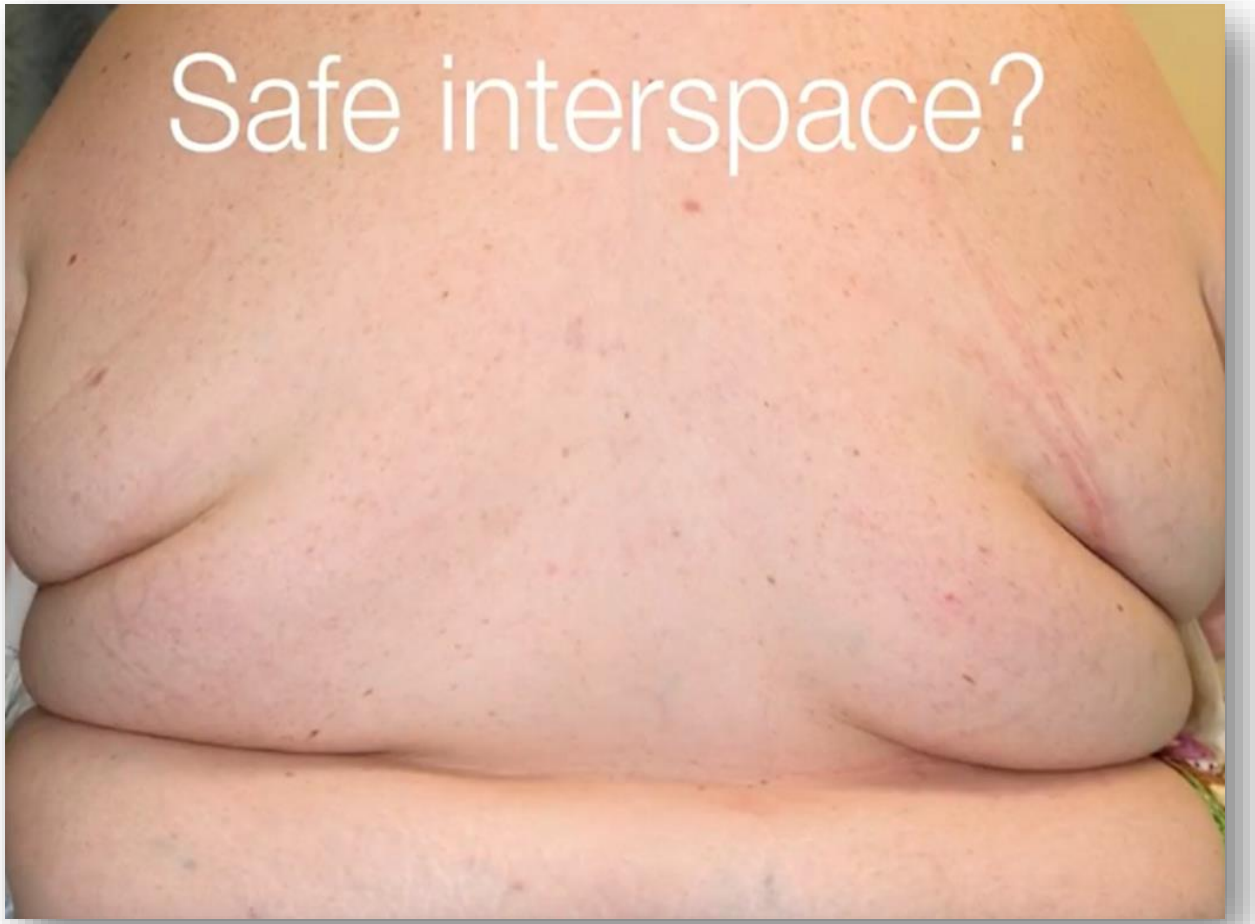
Transverzální

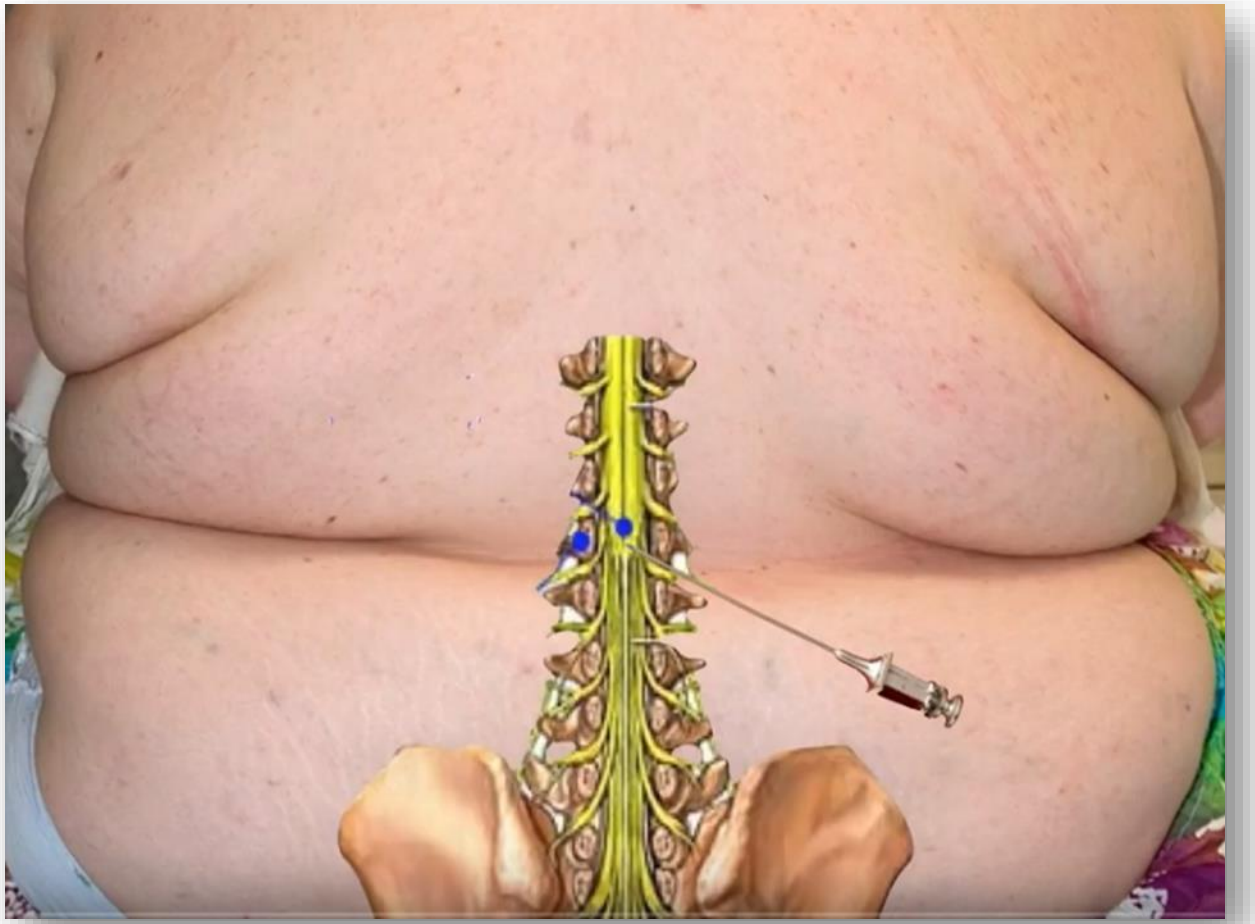


Sagitální

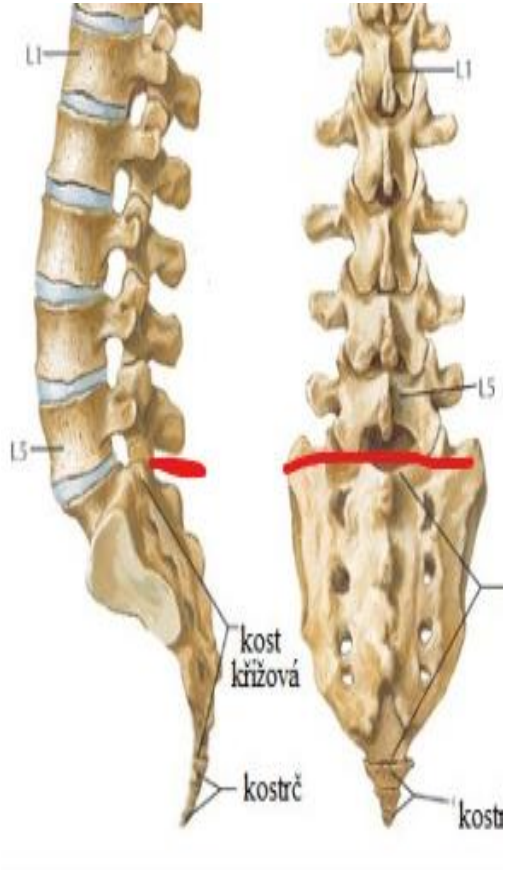


Najdi 10 rozdílů


Safe interspace?



S1-L5


L1
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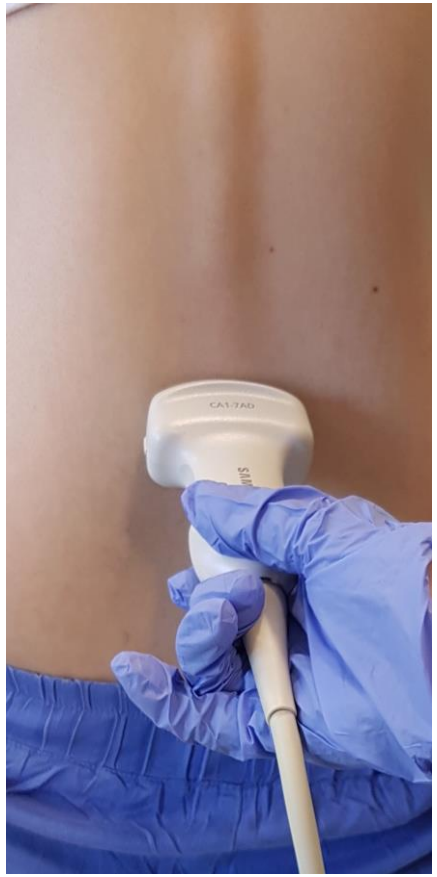

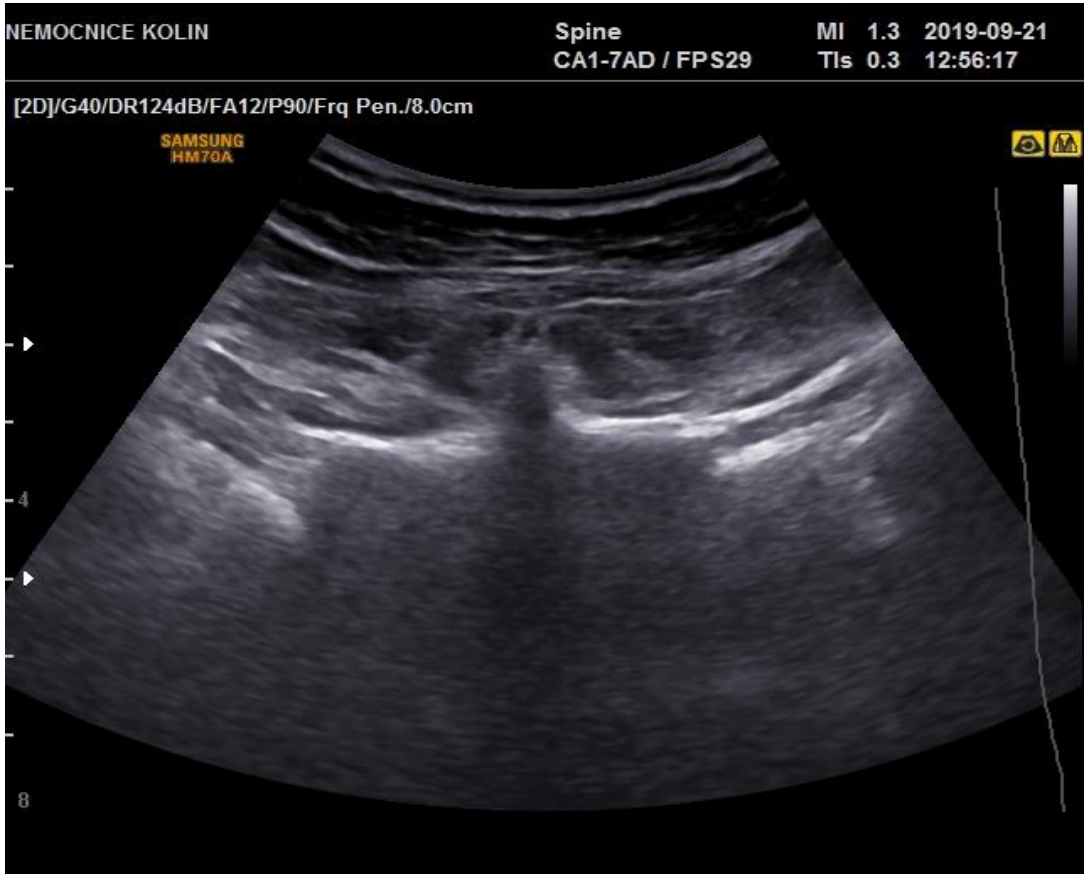
NEMOCNICE KOLIN
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[2D]/G40/DR124dB/FA12/P90/Frq Pen./8.0cm
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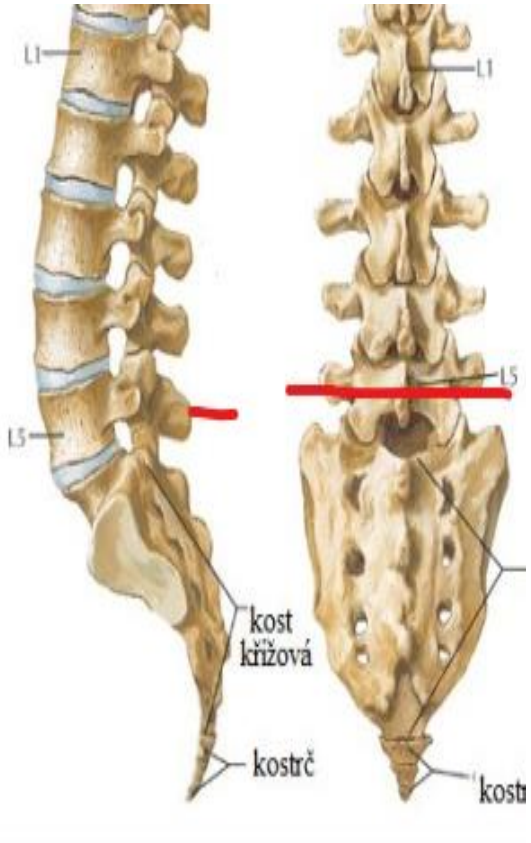
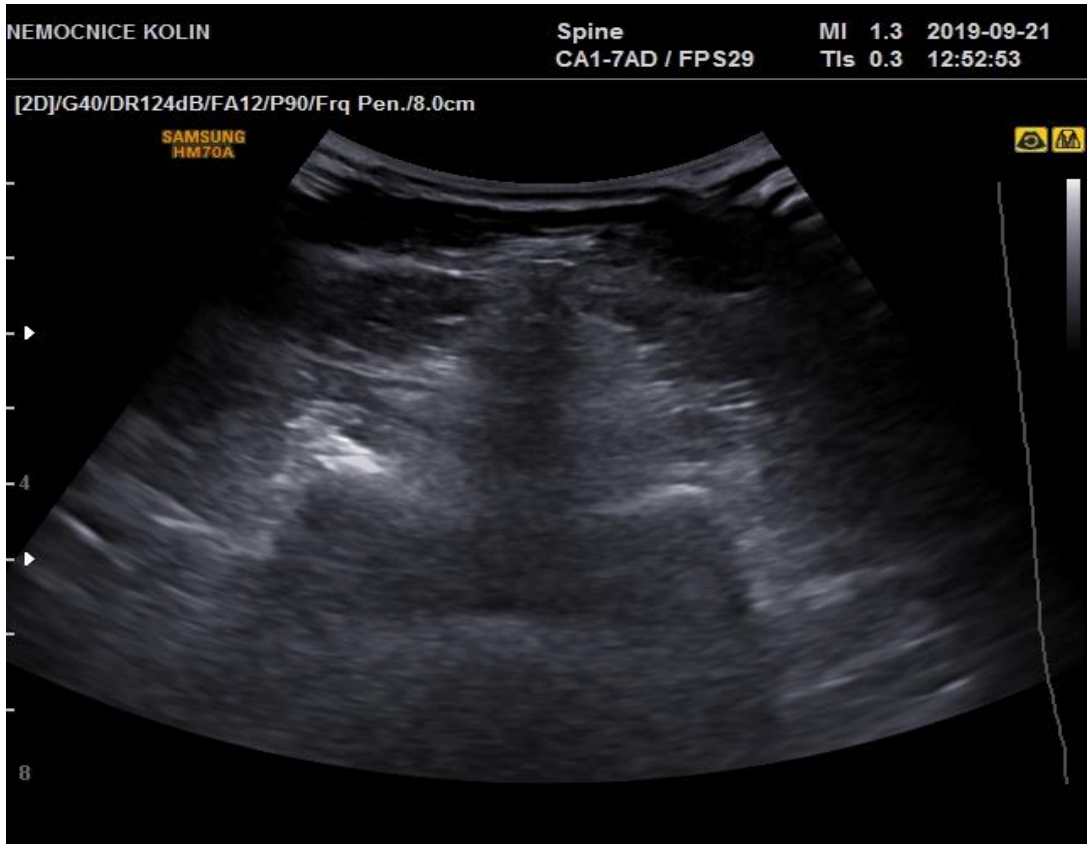
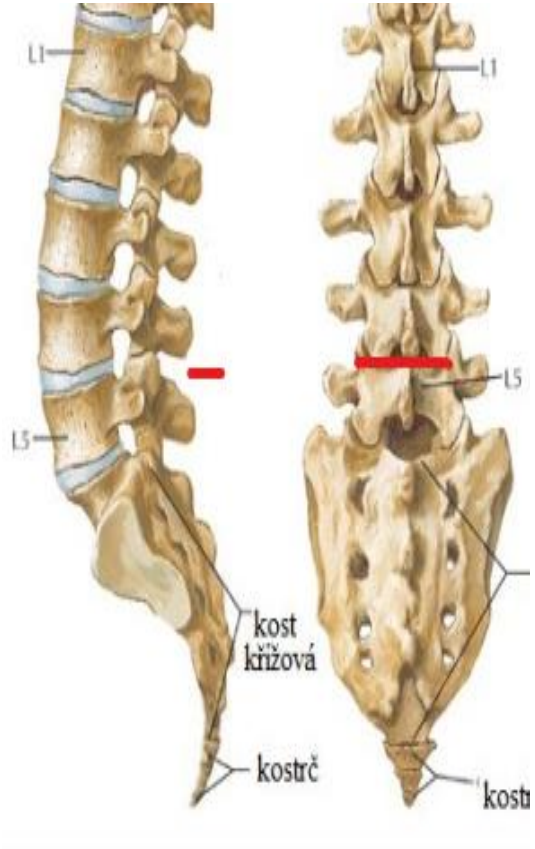
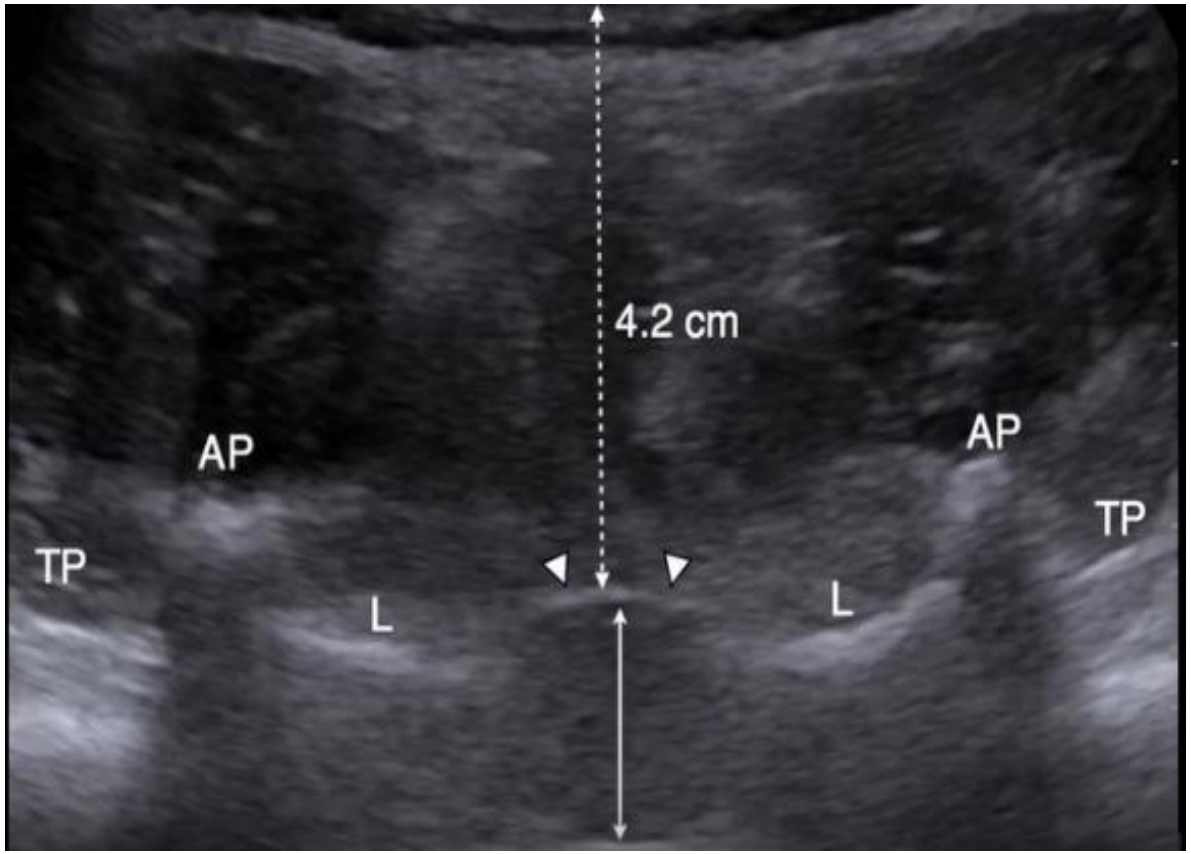
L5 procesus spinosus



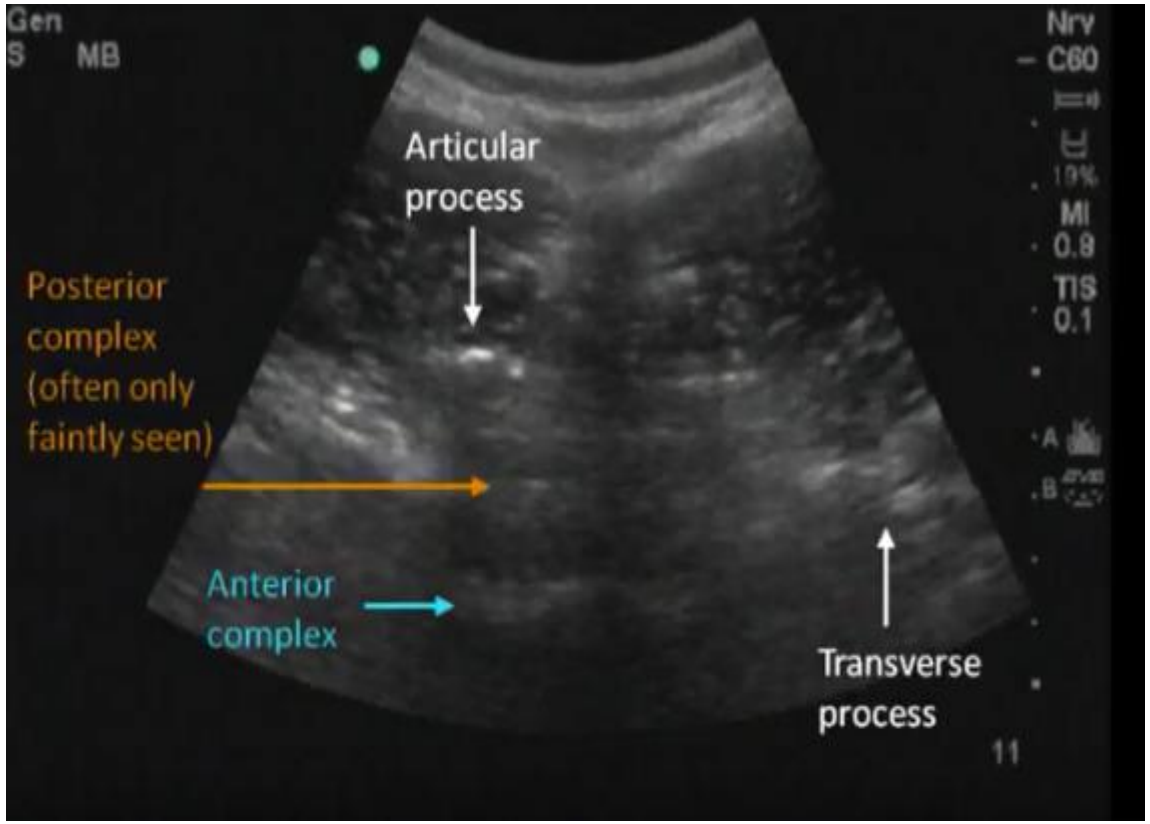


L5 – L4 interspinosní prostor



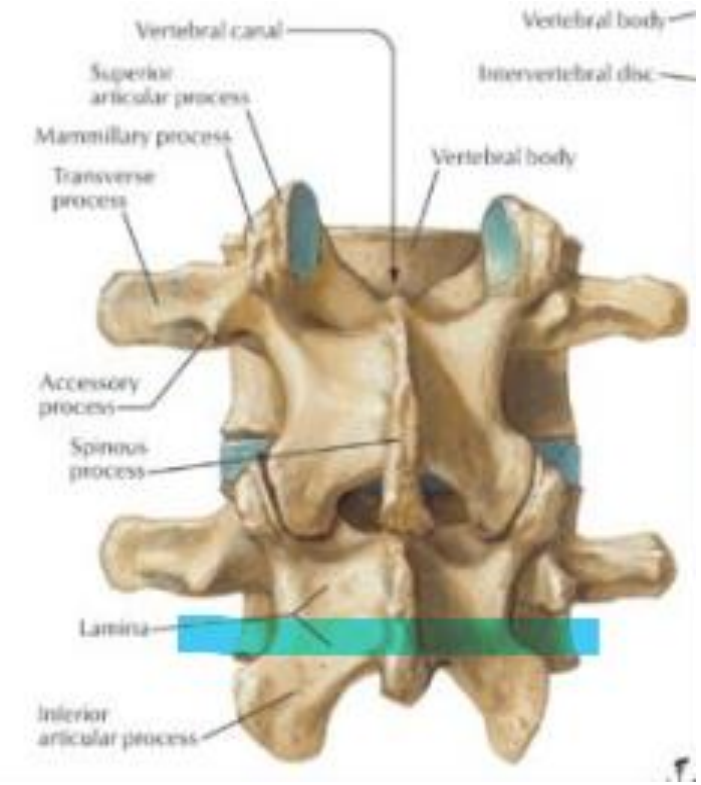


L4 – L3

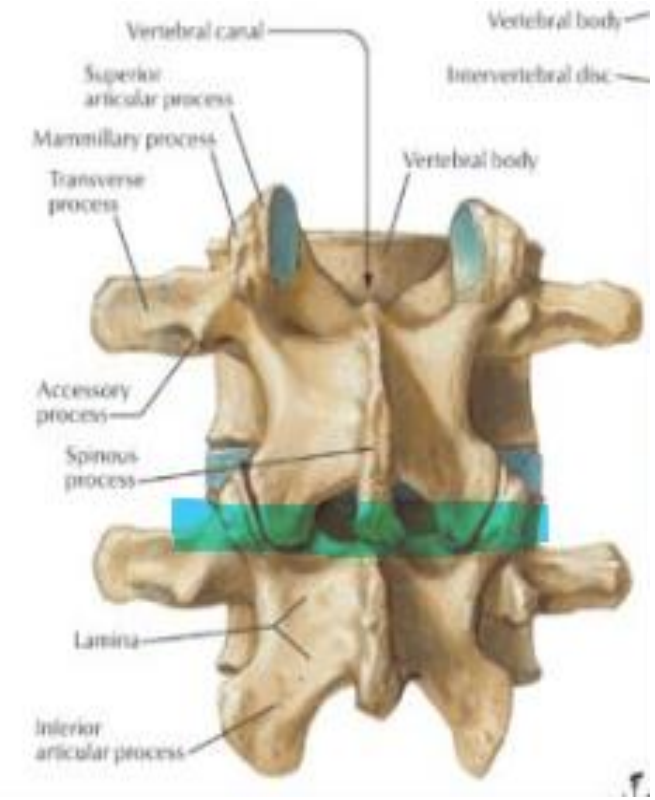

Articular process
Posterior complex (often only faintly seen)
Anterior complex
Transverse process

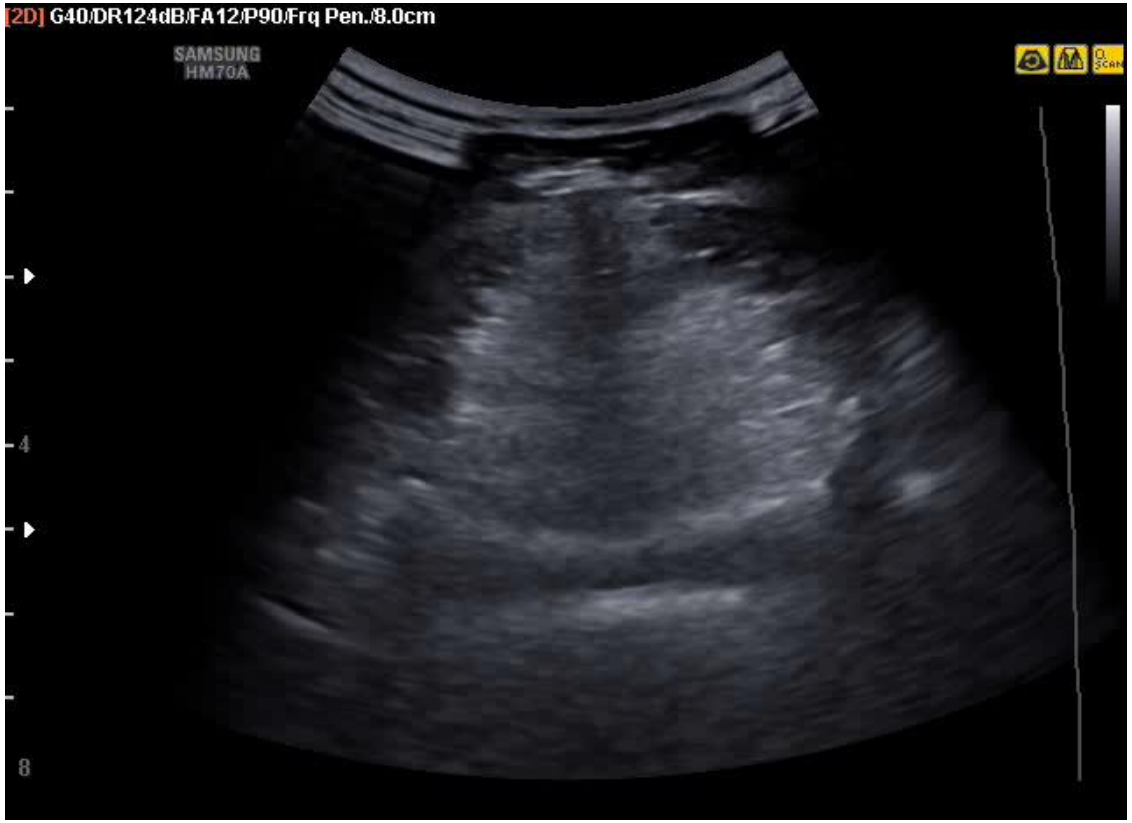

[2D] G40/DR124dB/FA12/P90/Frq Pen./8.0cm
SAMSUNG
HM70A

L 5 transverzální

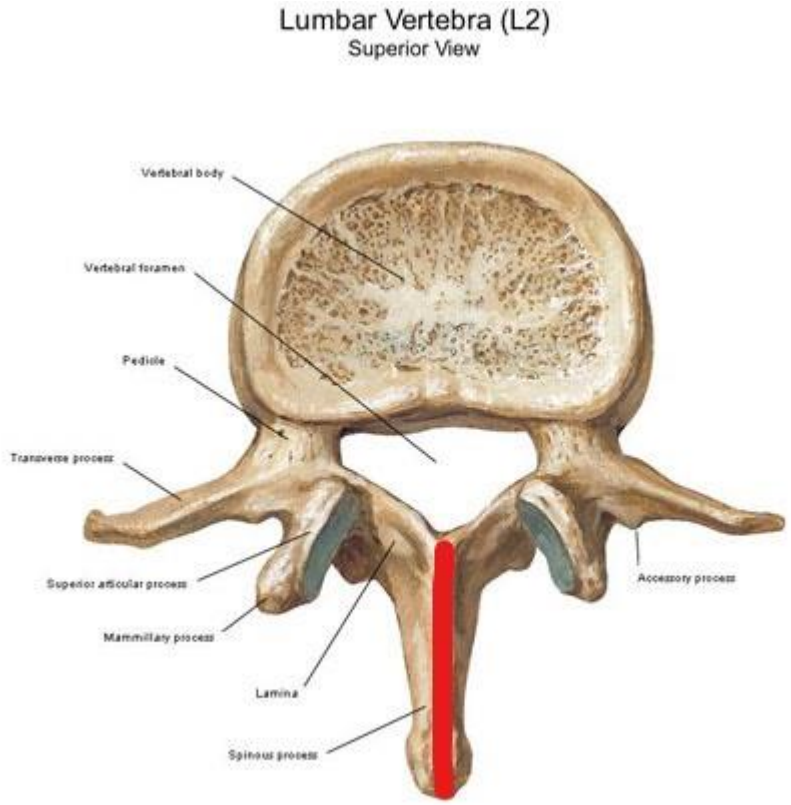


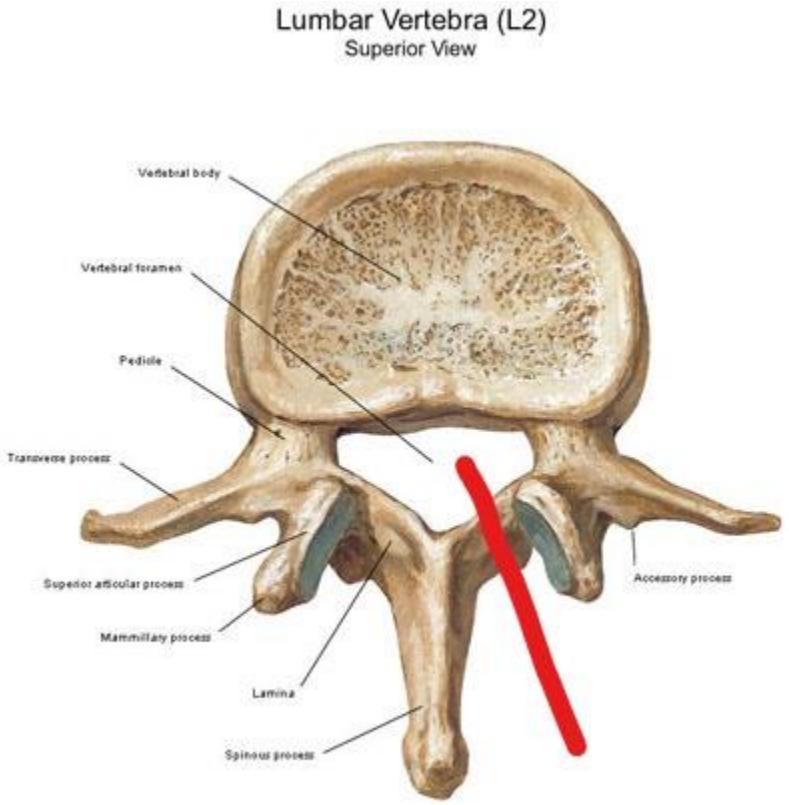
L5-L4 transverzální

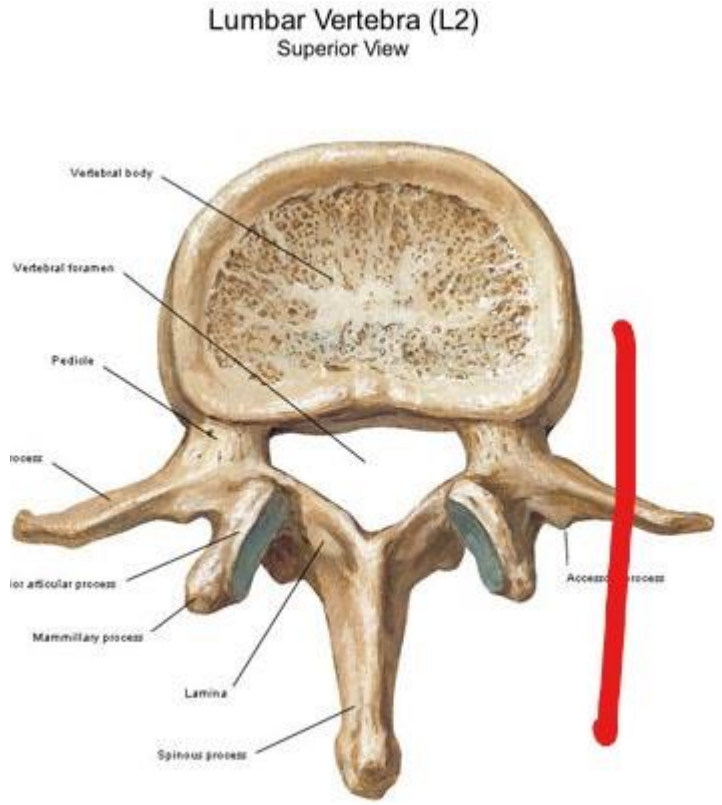




Sagitální 1 2 3

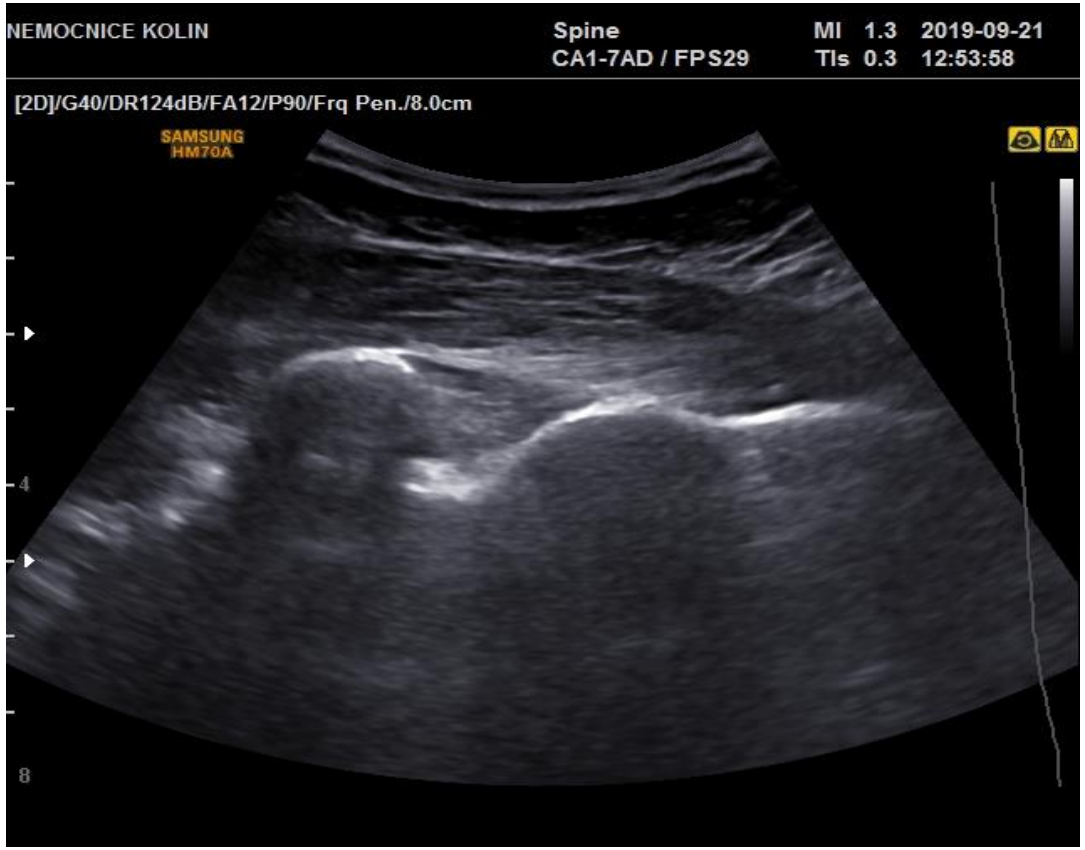






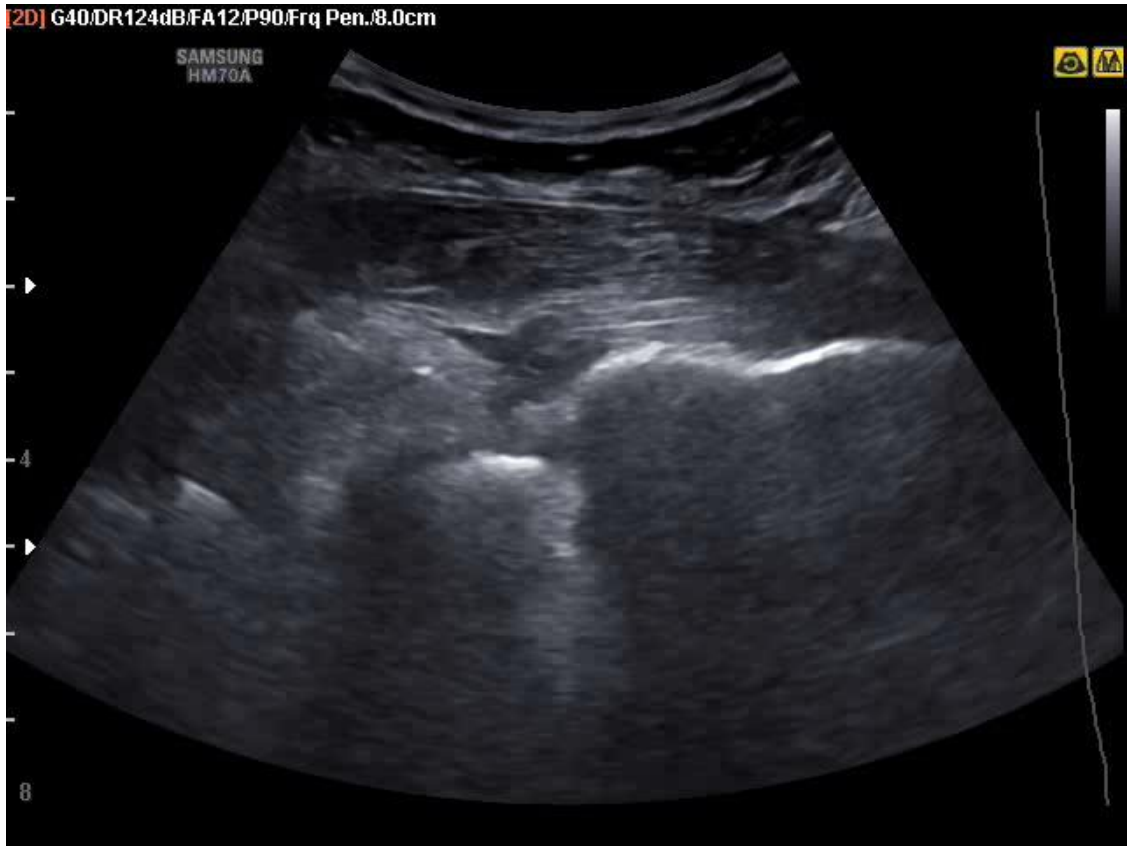
Sacrum – L5


L1
L5
kost
křížová
kostr

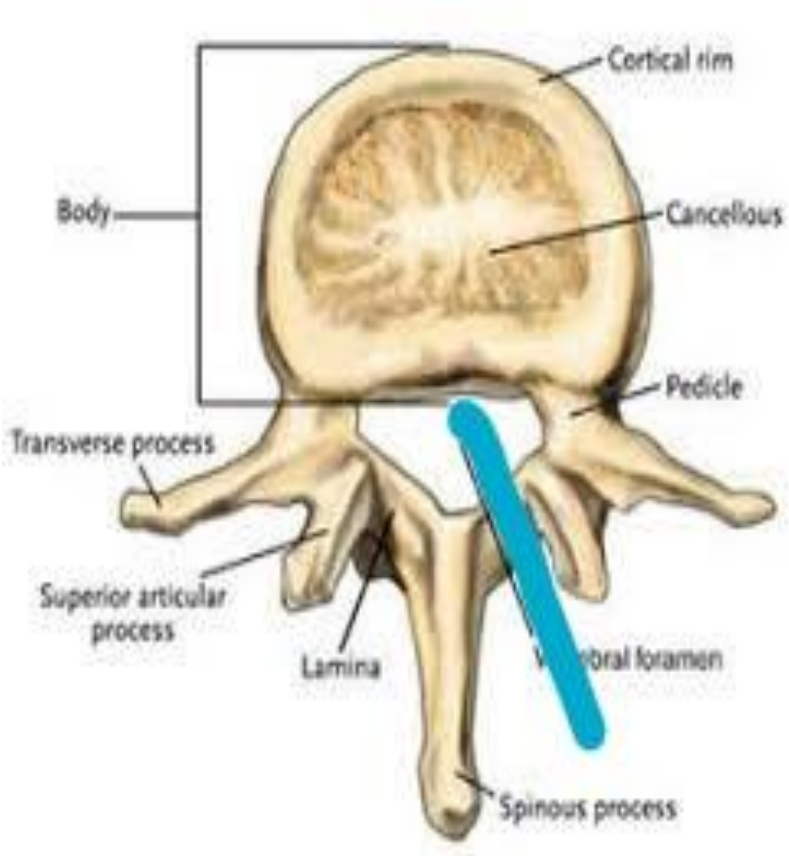

NEMOCNICE KOLIN
Spine
CA1-7AD / FPS29
MI 1.3
TIs 0.3
2019-09-21
12:53:58
[2D]/G40/DR124dB/FA12/P90/Frq Pen./8.0cm
SAMSUNG
HM70A
4
8

Sacrum

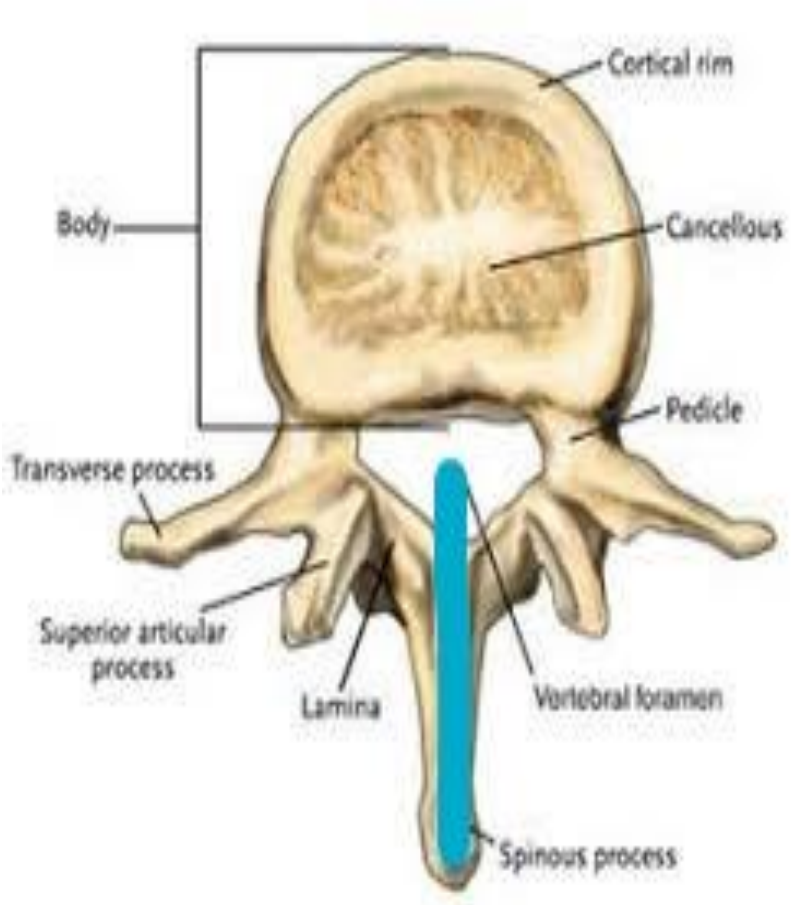

L1
L5
kost
křížová
kostr


[2D] G40/DR124dB/FA12/P90/Frq Pen./8.0cm
SAMSUNG
HM70A
4
8

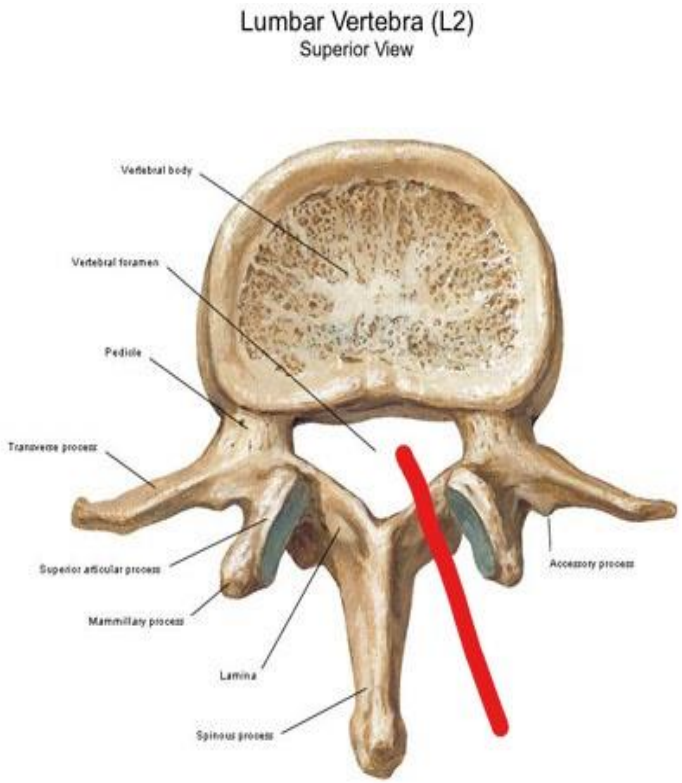
Paramediální sagitální L5 - L4 - L3 – L2

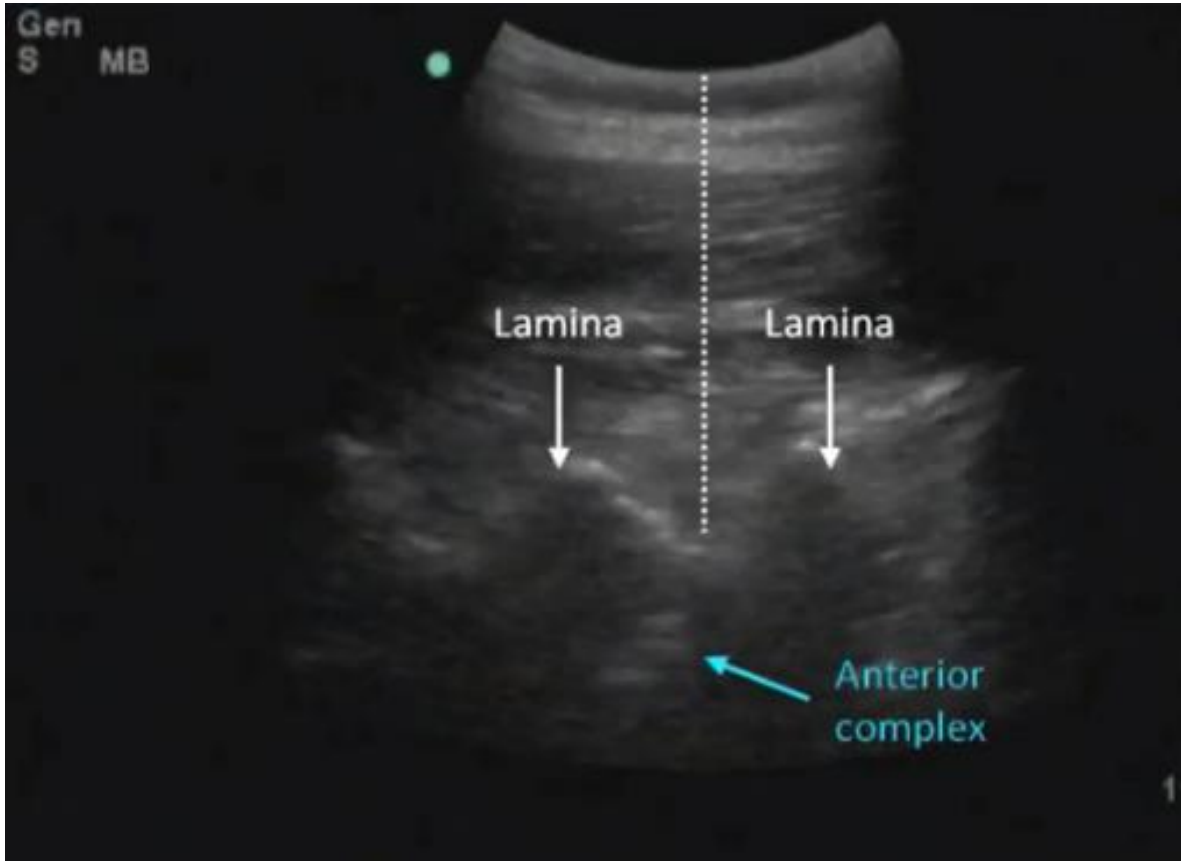


Processus spinosus

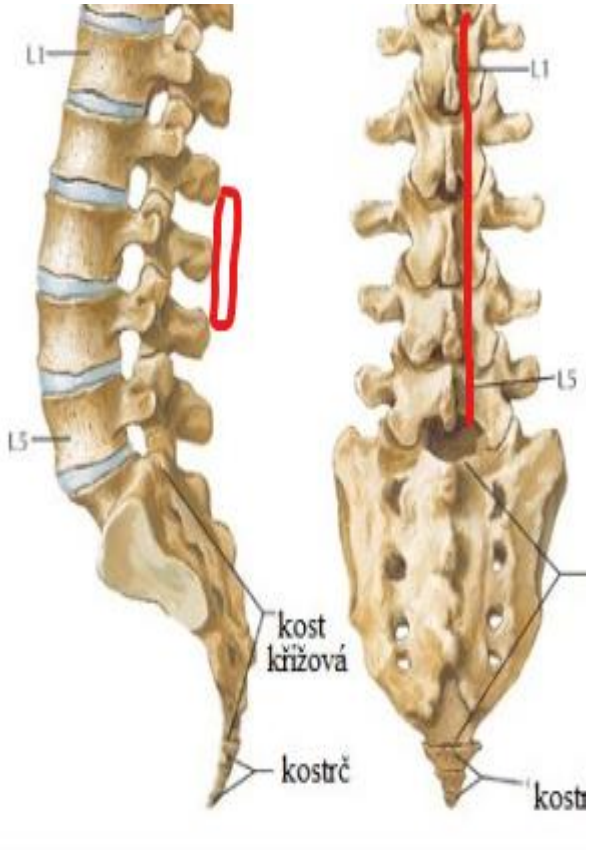


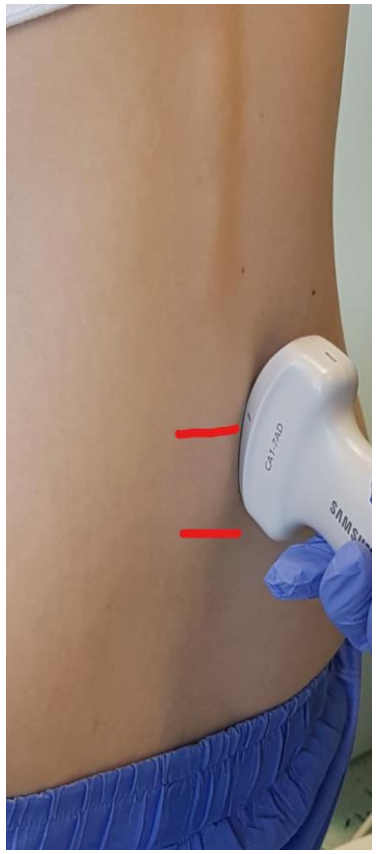
Paramediální sagitální L3 – L4

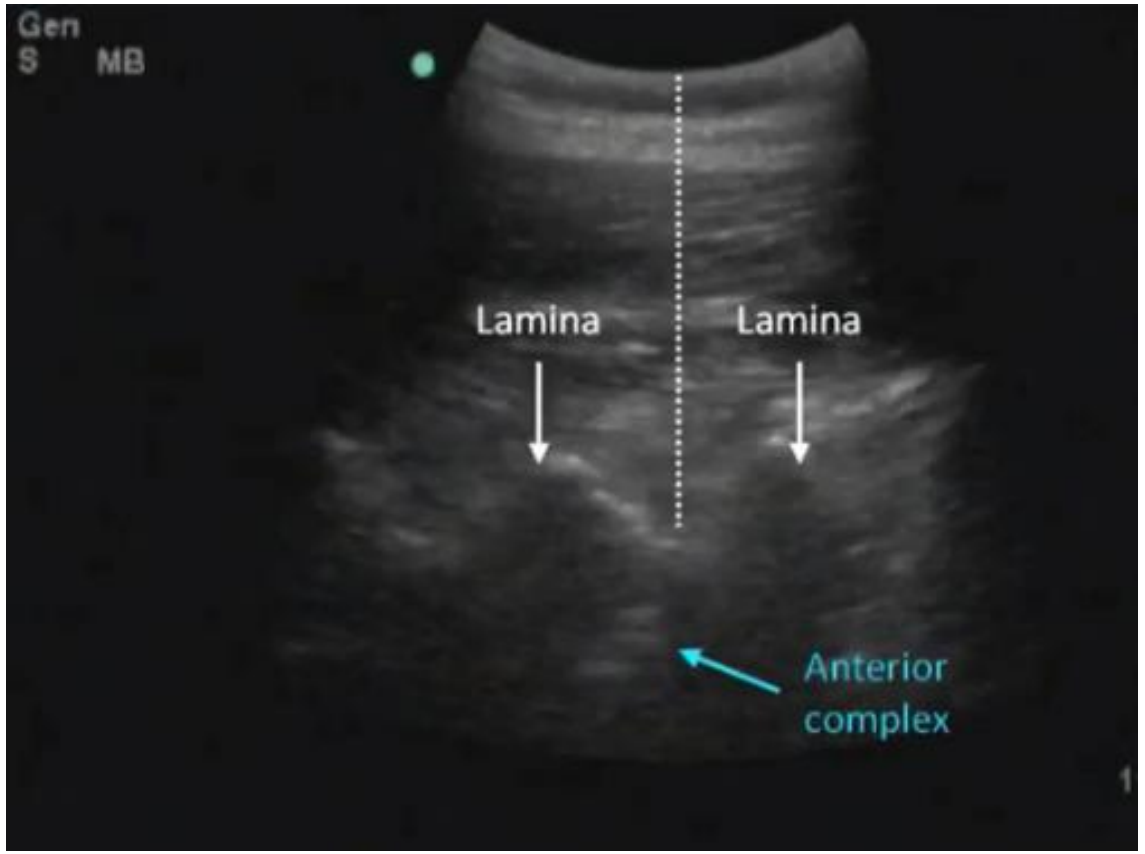




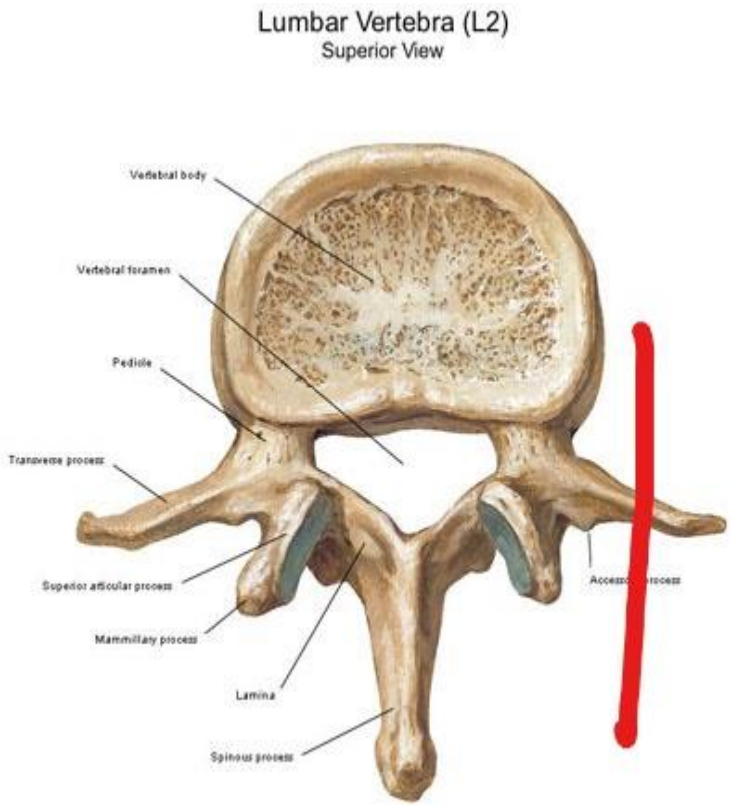
L3 - L4

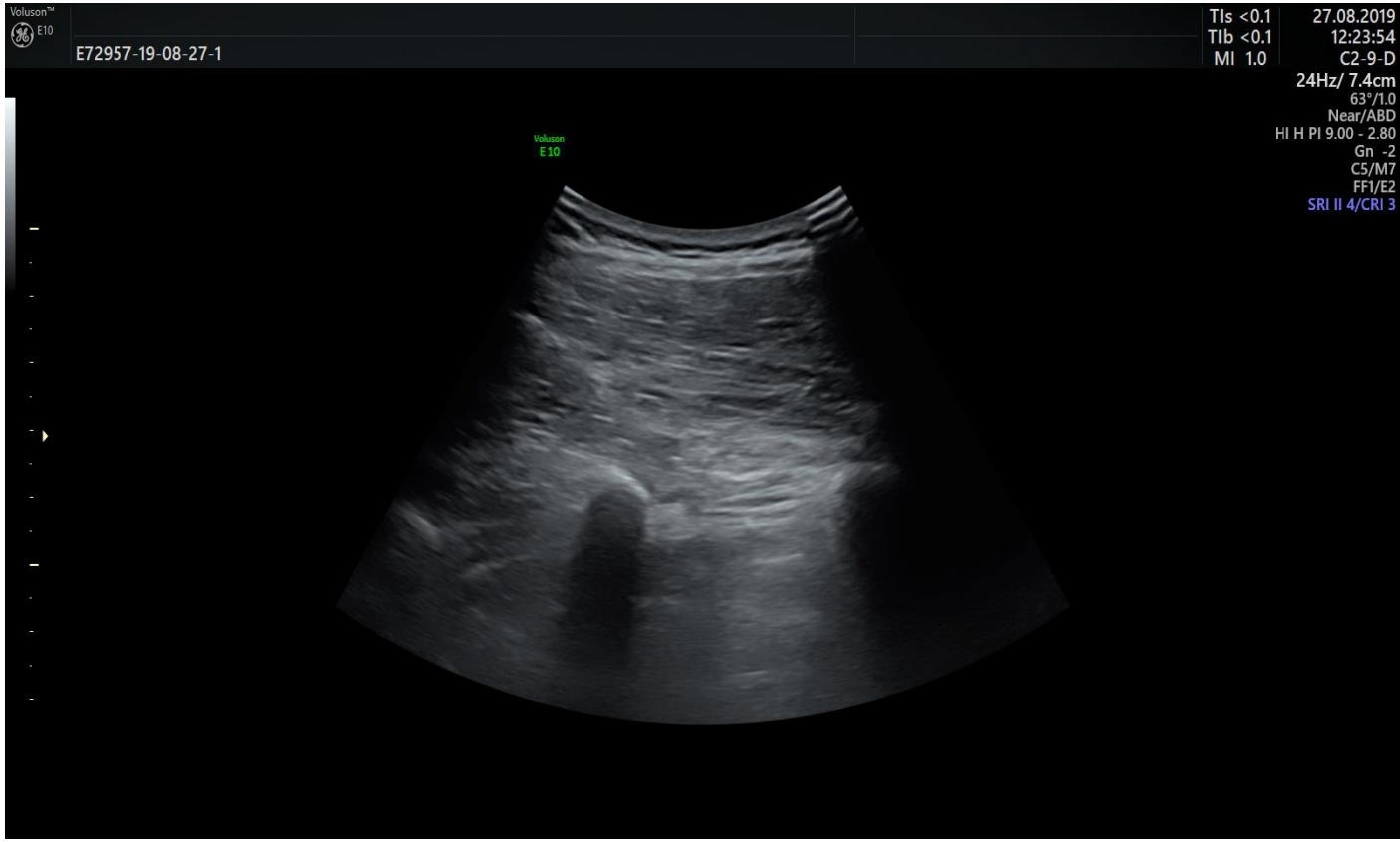

L1
L5
kost
křížová
kostrč
L1
L5
kost

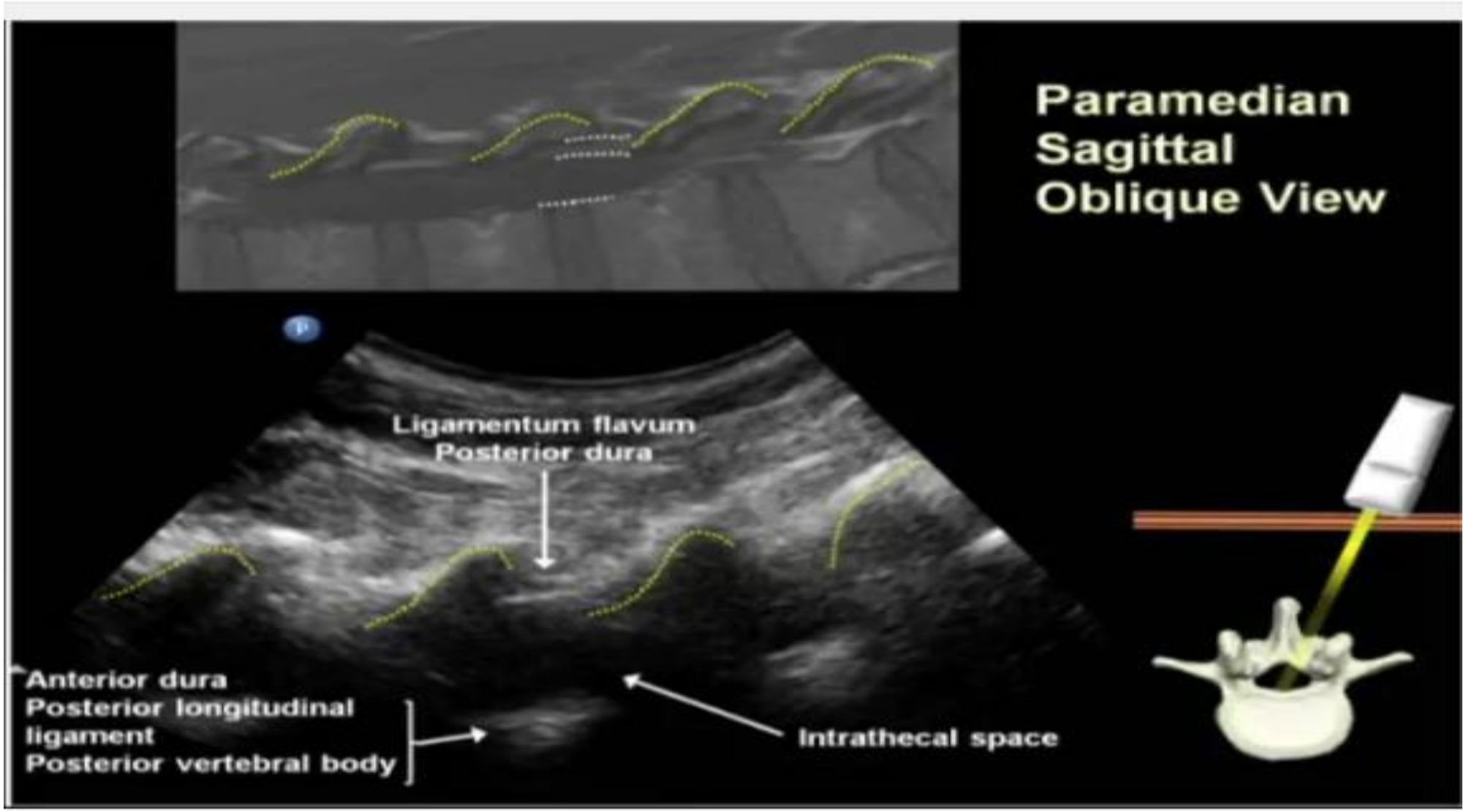


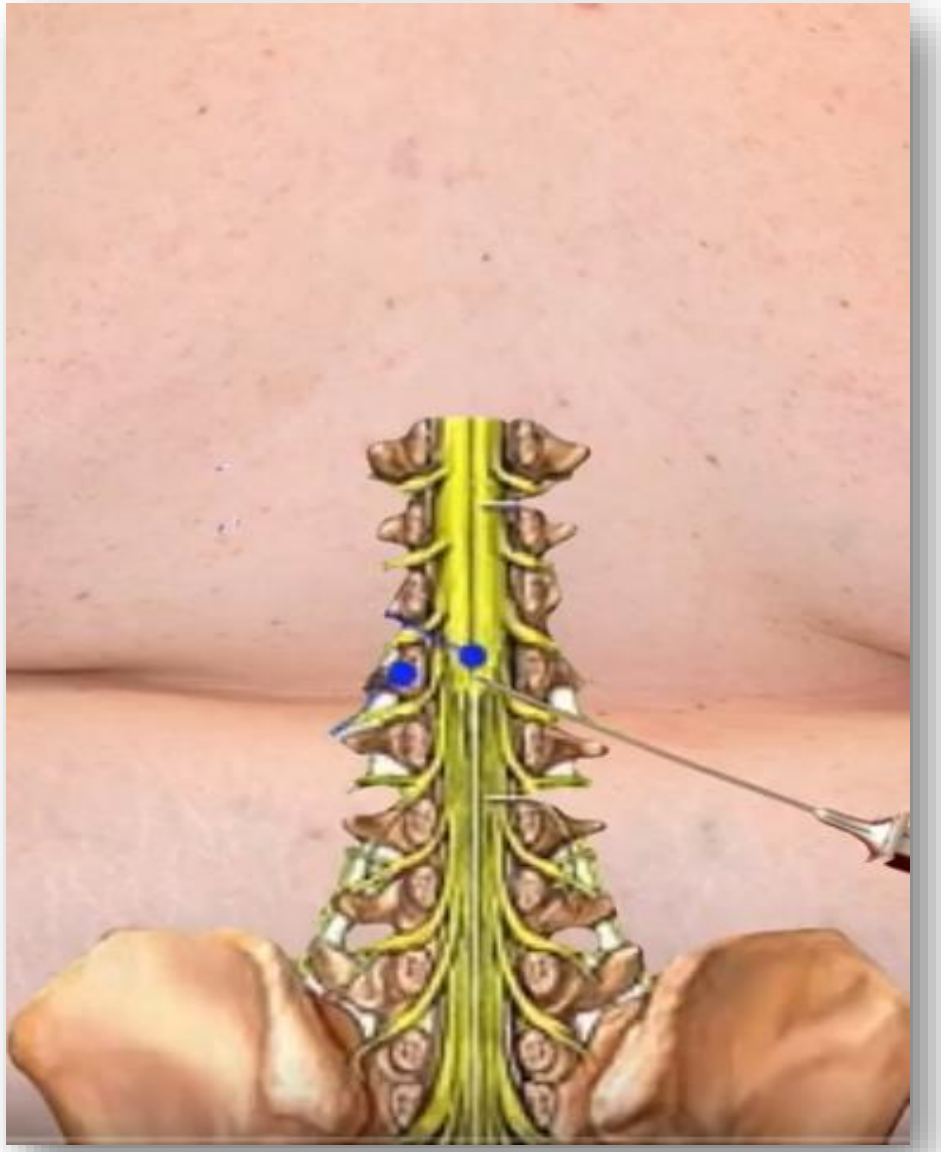

Gen
S MB
Lamina
Lamina
Anterior
complex

Paramediální processus transverzum L3-L4





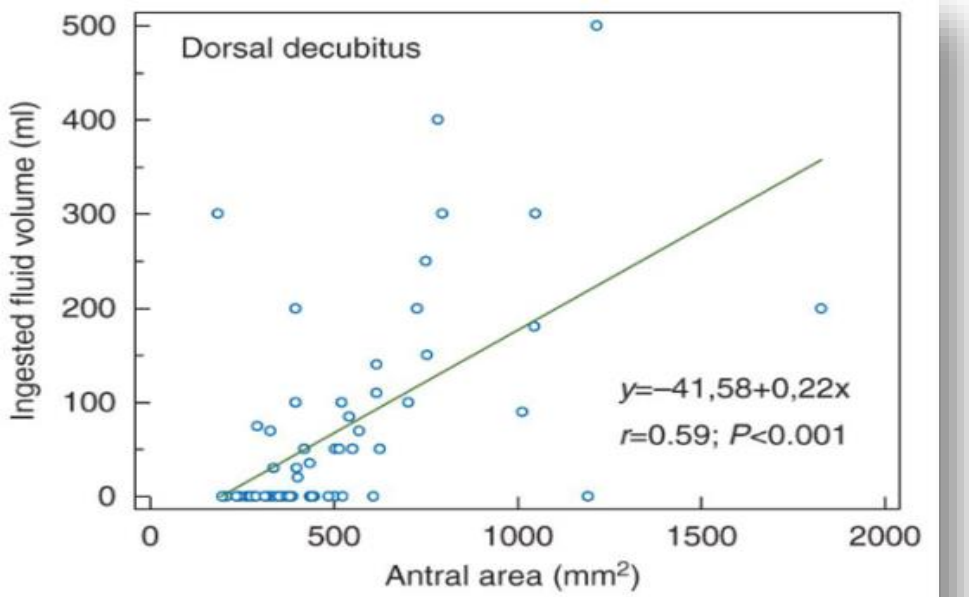

Paramedian
Sagittal
Oblique View
Ligamentum flavum
Posterior dura
Anterior dura
Posterior longitudinal
ligament
Posterior vertebral body
Intrathecal space

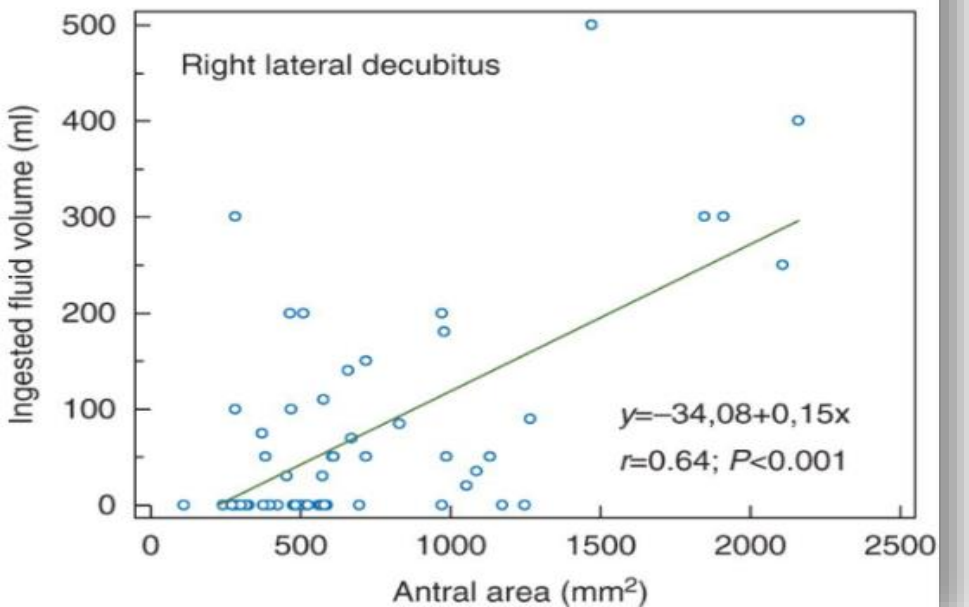


Co je jinak u těhotné?

- Obezita ,edém, anatomická anomálie – nepřehledný terén obtížná palpace zúžení interspinalního prostoru.
- Interspinální vaz struktura - měkčí a nehomogenní – mylně pocit ztráty rezistence.
- Epidurální prostor je užší.
- Vzdálenost od kůže je delší (v závislosti i na stupni těhotenství).
- Interspinální prostor je pod ostřejším úhlem.

Fig 1. Example of ultrasound measurement of gastric antral area in a parturient. European Jo





BJA

British Journal of Anaesthesia, 117 (2): 198–205 (2016)

doi: 10.1093/bja/aew171

Obstetrics

OBSTETRICS

Ultrasonographic measurement of antral area for estimating gastric fluid volume in parturients

L. Zieleskiewicz[1], M. C. Boghossian[1], A. C. Delmas[1], L. Jay[2], A. Bourgoin[1], X. Carcopino[3], M. Poirier[1], B. Cogniat[2], A. Stewart[4], D. Chassard[2,5], M. Leone[1,6] and L. Bouvet[2,7,*] for the AzuRea and CAR'Echo Collaborative Networks

GAA increased proportionally with ingested volume of clear fluid .

The correlation coefficients were 0.59 (P <0.001) and 0.64 (P <0.001) for GAA measured in the supine and right lateral positions, respectively.

Bedside Gastric Ultrasonography in Term Pregnant Women Before Elective Cesarean Delivery

A Prospective Cohort Study

Arzola, Cristian MD, MSC*; Perlas, Anahi MD, FRCPC†; Siddiqui, Naveed T. MD, MSc*; Carvalho, Jose C. A. MD, PhD, FANZCA, FRCPC*

Anesthesia & Analgesia: September 2015 - Volume 121 - Issue 3 - p 752–758
doi: 10.1213/ANE.0000000000000818
Obstetric Anesthesiology: Research Report

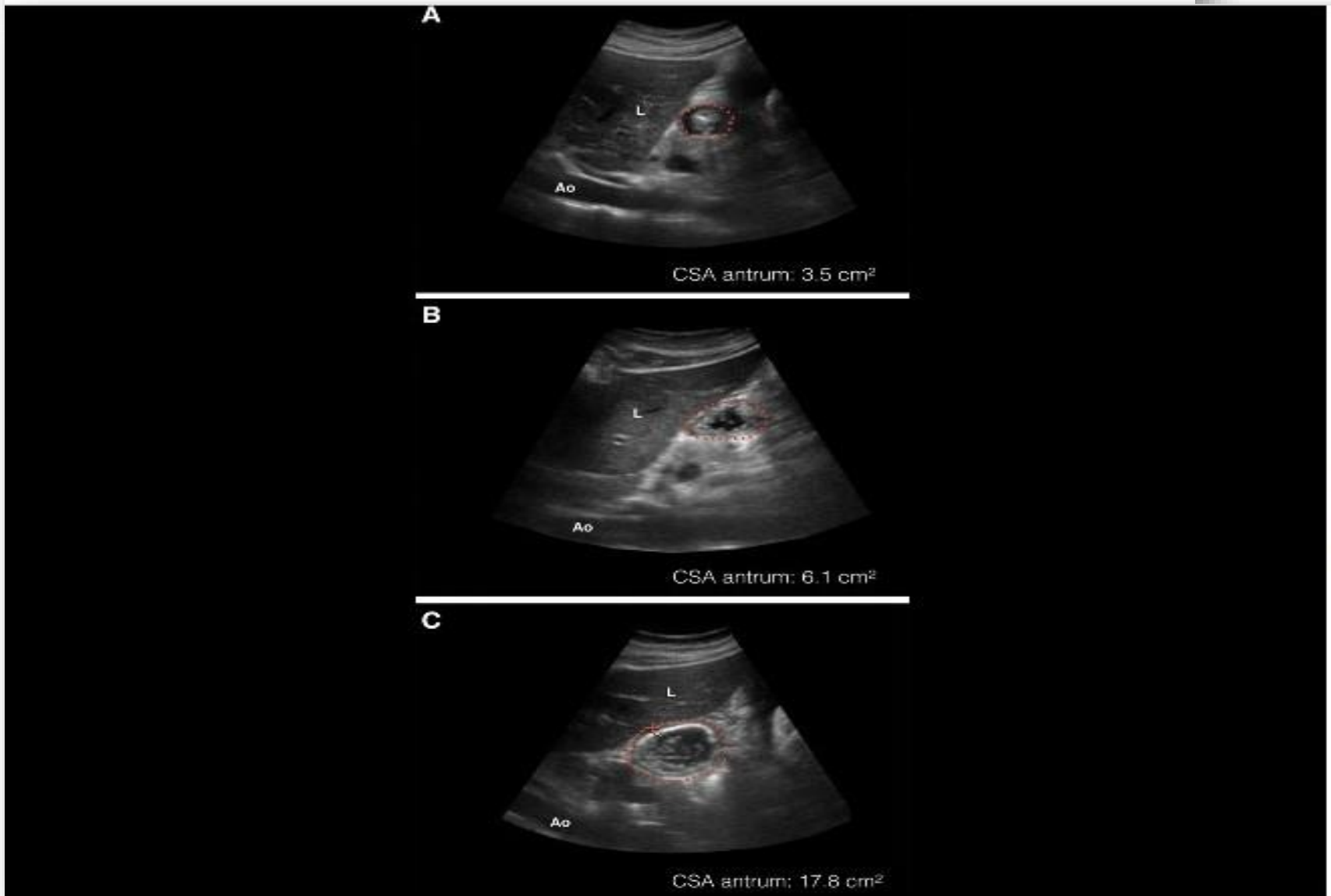


Figure 1

Sonographic images of the epigastric area in a parasagittal plane with the pregnant women in the right lateral decubitus. The red dotted line surrounding the gastric antrum represents the manual free-tracing method of cross-sectional area measurement. Antrum: (A) grade 0; (B) grade 1; and (C) grade 2. Ao = aorta; CSA = cross-sectional area; L = liver.

Source

Bedside Gastric Ultrasonography in Term Pregnant Women Before Elective Cesarean Delivery: A Prospective Cohort Study

Anesthesia & Analgesia121(3):752-758, September 2015.

EJA European Journal of Anaesthesiology

Determination of a cut-off value of antral area measured in the supine position for the fast diagnosis of an empty stomach in the parturient

A prospective cohort study

Jay, Lucille; Zieleskiewicz, Laurent; Desgranges, François-Pierrick; Cogniat, Bérengère; Pop, Marius; Boucher, Pierre; Bellon, Amandine; Léone, Marc; Chassard, Dominique; Bouvet, Lionel for the AzuRea collaborative network

European Journal of Anaesthesiology (EJA): March 2017 - Volume 34 - Issue 3 - p 150–157
doi: 10.1097/EJA.0000000000000488
OBSTETRICAL ANAESTHESIA

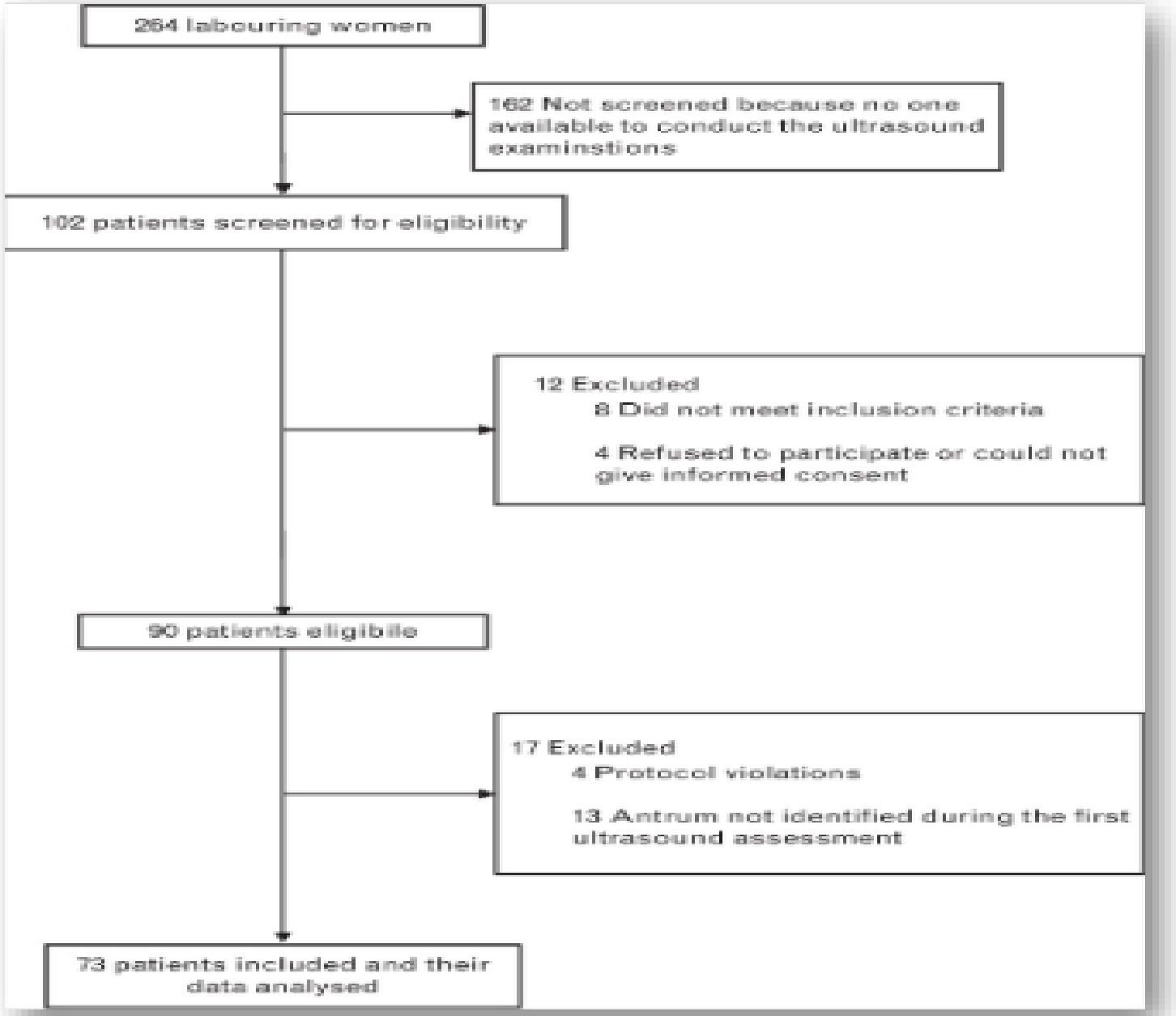


Fig. 2
Flow chart.

European Journal of Anaesthesiology (EJA)34(3):150-157, March 2017.

Characteristics	
Age (years)	30 ± 5
Height (cm)	165 ± 7
Weight (kg)	78 ± 13
BMI ($kg.m^{-2}$)	29 ± 5
Gestational age (days)	274 ± 7
Parity[a]	
0	21 (28.8)
1	26 (35.6)
2	14 (19.2)
3	12 (16.4)
ASA physical status[a]	
1	59 (80.8)
2	14 (19.2)
Fasting duration for clear fluids (hours)	5 ± 4
Fasting duration for solids and non-clear fluids (hours)	10 ± 5

Data are presented as mean ± SD unless otherwise indicated. ASA, American Society of Anesthesiologists. [a]Data are given as number (percentage of patients).

Table 1
Patient characteristics

European Journal of Anaesthesiology (EJA)34(3):150-157, March 2017.

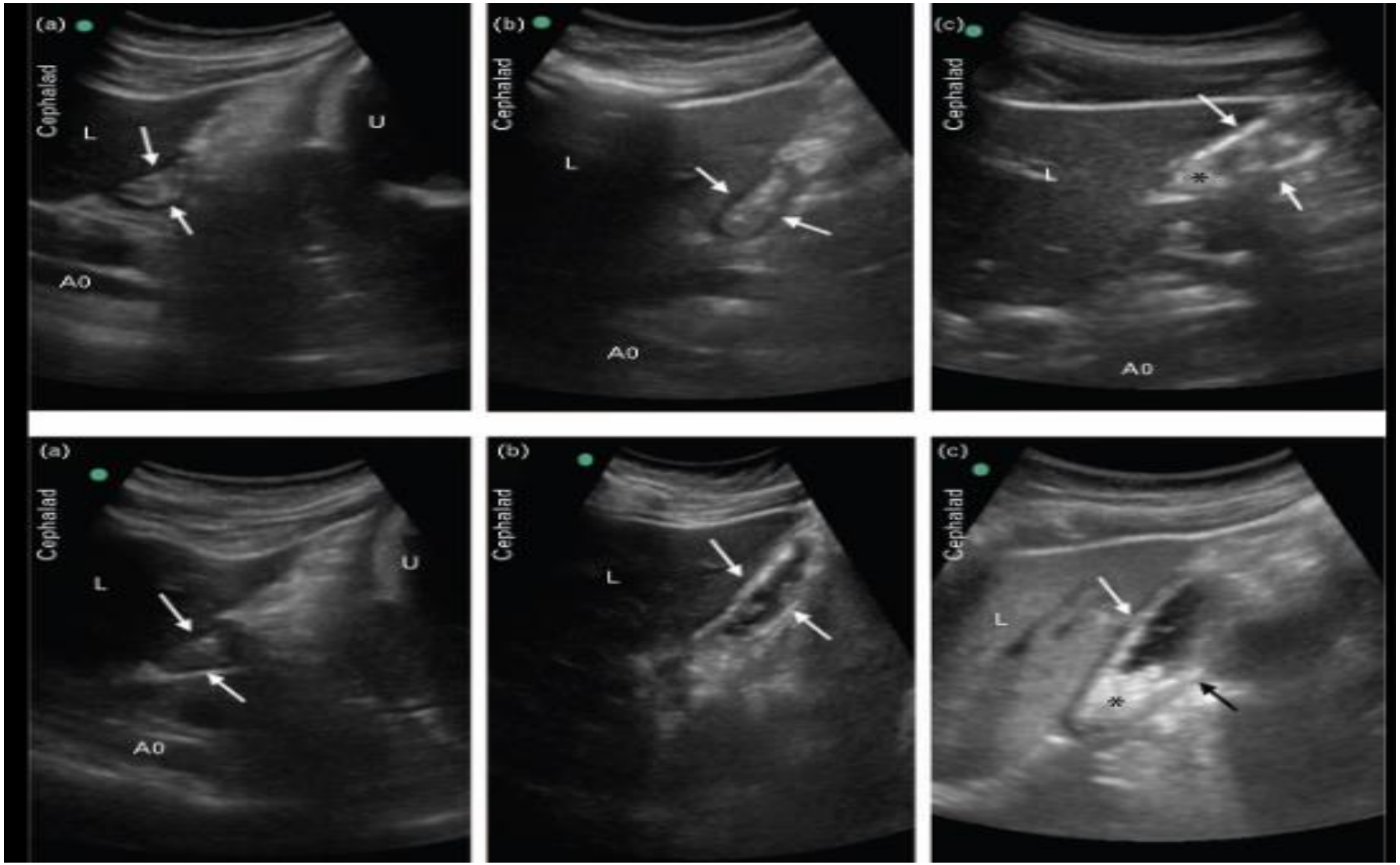
	Antral area <381 mm²	Antral area ≥381 mm²	*P* value
Antral grade			
0 (*n* = 33)	26	7	<0.0001
1 (*n* = 16)	7	9	
2 (*n* = 11)	1	10	
3 (*n* = 13)	0	13	

Data are expressed as counts. Grade 0 vs. grades 1, 2 and 3 combined.

Table 4

Mean fasting duration for solids/non-clear fluids, and for clear fluids, according to the antral grade and to the antral area status

European Journal of Anaesthesiology (EJA)34(3):150-157, March 2017.



European Journal of Anaesthesiology (EJA)34(3):150-157, March 2017.

Examples of ultrasound examination of the stomach performed in the supine position (first row) and the right lateral decubitus position (second row). The antrum is identified by the arrows. (a) Perlas*et al.*[10] grade 0; (b) Perlas *et al.*[10] grade 1; (c) grade 3 defined as the visualisation of echoic solid content (*). L, liver; U, uterus; Ao, aorta.

Souhrn

- Komfort pro pacientky
- Optimalizace místa vpichu
- Snížení počtu pokusů
- Definice vzdálenosti / hloubky punkce
- Management terapie – hemodynamika
- Informace o žaludeční náplni- kvantitativní a kvalitativní zhodnocení žaludeční náplně
- Zhodnocení rizika možné aspirace

Děkuji Vám za pozornost