DR IAIN DUNCAN

Ultrasound Reference Ranges: Updated FEB 2016

Please note these data are for reference only and have no official or professional endorsement

SITE	CONTEXT	MEASUREMENT
Ankle/brachial index	Normal Mild to mod ischaemia Severe	>0.95 0.5 to 0.95 <0.5
Arterial bypass graft	High risk of failure if…	PSV < 45 or > 150
Arterial Graft Stenosis	Art bypass graft stenosis (vein graft) 60-70% >75%	200-400cm/s or ratio 2-4 >400 cm/s or ratio >4.0
Bladder wall	Normal width (Full bladder)	3-6mm
Calcaneal nerves	ICN: Baxter's nerve seen b/w FDB and Quad Planae Medial plantar nerve	Echogenic/denervated Abd dig minimi Knot of Henry (Xover FDL/FHL deep to Abd Hall)
Carotid stenosis	Less than 50% diameter narrowing[i]	PSV <155cm/s
Carotid stenosis	50-69% diameter narrowing[i]	PSV 155-230 cm/s and ICA/CCA ratio of ≥2
Carotid stenosis	>70% diameter narrowing	PSV > 230 (ICA/CCA > 4.0 supportive)
Carotid stenosis	>80% diameter narrowing	EDV of ≥140 cm/s, a PSV ≥370 cm/s and ICA/CCA ratio of ≥6
Carotid stenosis	Occlusion	No patent lumen & no flow on color, doppler, and power U/S
Carotid stenosis post CEA	No reliable figures. note 2x PSV at distal end patch is OK	Progressive increase or PSV > 180
Carotid stenosis with stent[ii]	>50% >80%	PSV > 220 & IC/CC ratio > 2.7 PSV >340 & IC/CC ratio > 4.15
Carpal Tunnel Syndrome	See median nerve.	
Central retinal artery	RI	>0.7

	PSV	>13 cm/s
Cerebellum	Foetal 2ND trimester	= number weeks gestation
Cervix	Length in pregnancy Cx incompetence < 2cm	35-50mm
Cisterna magna	Foetal 18 weeks (Normal range) Pathological	2-10mm >13mm
Club foot	MM-Navicular distance (neutral) MM-Navicular distance (Abduction)	<4mm (normal 9^{+-4}) <7mm (normal 12^{+-5})
Coeliac artery	Normal low resistance flow	60-140 cm/s
Coeliac stenosis	Poor sensitivity.	PSV > 200 tardus-parvus in spleen/ liver
Common bile duct	Diameter	<7mm
Common bile duct	Diameter post cholecystectomy	<10mm
Common hepatic duct	Diameter	<7mm
Cord tethering	Lose pulsatility, not central, wrong level conus	*count up from 1st sacral segment*
Conus medullaris	Level at birth 6mths age	L2,3 disc L1
Endometrium *pre-menopause	Proliferative phase Secretory	<8mm <15mm
Endometrium *post-menopause	Regardless of therapy	<5mm
FATTY LIVER	MILD MODERATE SEVERE	Hyperechoic only without fatty sparing (latter =mod/severe) +loss of portal tract visibility +severe beam attenuation
FIBROSIS LIVER** *median of 10 readings **less reliable with more fat	Significant fibrosis (shearwave speed) Severe fibrosis Cirrhosis	>1.35 m/sec* >1.55 >1.80
Femoral artery stenosis	30-49% diameter narrowing 50-69% 70% >75%	PSV X 1.5 PSV x 2, PSV > 200, EDV>100 PSV x 3 PSV x 4

Flexor tendons	Max width at 2-4mcp	3.7mm
Foetal age (days)	MGSD= mean gestational sac diameter	30 +MGSD
Foetal bladder	Sagittal dimension Normal size (+-7mm) Megacystis (posterior urethral valves, vesico-ureteral reflux, megaureter or prune-belly syndrome)	GA in weeks −5 Sag length > GA+12
Foetal cephalic index	BPD/FOD x 100	78 +- 5
Foetal Femur	Short femur	Placental insufficiency (check UA Doppler & "cupcake"placenta) trisomy, skeletal dysplasias
Foetal heart circumference	All gestations	<50% thoracic circumference
Foetal kidneys	K:A ratio (AP abdomen any age)	0.27-0.30
Foetal kidneys	Pyelectasis	<5 (2ndT); <7mm (3rdT)
Foetal T:A ratio	Standard Abdo C, thorax at 4 chamber level	>0.75
Foetal soft signs 2nd trimester. Isolated *Liklihood ratios for each as an isolated defect (from JOGCJune2005 and Agathokleous*[iii] *). Only a single abnormality with all others absent. This ratio should be multiplied by the background maternal risk or the adjusted 1st trimester risk.	Aberrant right subclavian artery Nuchal thickening Short humerus echogenic bowel Short femur echogenic cardiac focus pyelectasia, single UA, enlarged Cis magna ventriculomegaly choroid plexus cyst nasal bone absent/hypoplastic	**3.94 (T21)** **3.8 (T21)** **0.8 (T21)** **1.65 (T21)** **0.6 (T21)** **0.95 (T21)** **1.08 (T21 and T18)** **3.8 (T21)** **1-1.5 (T21) and 7 (T18)** **6.6 ((T21)**
Foetal soft signs 2nd trimester for T21. Calculating likelihood ratios from 2nd trimester scan[iii]. *The compound risk is derived from multiplying all positive and negative ratios to obtain a derived ratio, which should then be multiplied by the background maternal risk or the adjusted 1st trimester risk.*	Aberrant right subclavian artery Nuchal thickening Short humerus echogenic bowel Short femur echogenic cardiac focus pyelectasia ventriculomegaly nasal bone absent/hypoplastic	21.5 (+) or 0.71 (-) 23.3 (+) or 0.80 (-) 4.8 (+) or 0.74 (-) 11.5 (+) or 0.90 (-) 3.7 (+) or 0.80 (-) 5.8 (+) or 0.80 (-) 7.6 (+) or 0.9 (-) 27.5 (+) or 0.94 (-) 23.3 (+) or 0.46 (-)
Gallbladder	Length x width	3x9cm

Gallbladder wall	Thickness	<3mm
Hip Joint	Effusion	>3mm capsular separation
Hydrocephalus	Neonatal brain: Ant Horn of LV at level of Foramen of Munro see also *subarachnoid space*	<5mm normal 5-10mm mild-mod >10mm severe
Inferior mesenteric artery	Patent, occluded or non-visualised *relevant if SMA or Coeliac disease*	
Inguinal Canal	Infants normal Infants hernia	<4mm at Internal ring >4mm
Inferior vena Cava	Normal	<3.7cm
Kidney	Adult	9-12cm
Kidney	Neonate	3.5-5cm
Lisfranc ligament	Tear can be assessed between Cuneiform1 and metatarsal2	Non-visualisation of the dorsal C1-M2 ligament and C1-M2 distance > 2.5 mm
Liver fibrosis	Normal shearwave stiffness Mild Mild-mod Mod-severe	2.0-4.5 kPa 4.5-5.7 5.7-12.0 >12.0
Median nerve	Area at proximal carpal tunnel	<0.10 cm^2
Median nerve	Transverse diameter (long axis)	<5.5mm
Median Nerve	Change in area between pronator quadratus and Carpal Tunnel	<2mm^2
Nuchal thickness	18 weeks	<6mm
Oligohydramnios[v]	AFI Deepest Pocket (SDP) Diamniotic pregnancy (SDP)	<5cm <2cm <2.2cm
Ovarian follicle	Dominant mid-cycle	<40mm
Ovarian size	<2yrs 2-puberty pre-menopause	<1cm^3 <4 cm^3 6-18 cm^3
Ovarian vein	Diameter Pelvic congestion (AJR 2004 March;	<5mm reverse flow; dilated transuterine

	182:683-688)	veins; varicocoele; PCO;
Paediatric HIPS[iv]	Femoral head coverage (normal) Femoral head coverage (abnormal) α-angle (normal) α-angle (abnormal)	>53% <40% >59° <50°
Parotid gland	axis parallel to the mandibular ramus transverse axis Extensions of the parotid parenchyma are lateral to the mandible dorsal to the mandible.	46.3 ± 7.7 mm 37.4 ± 5.6 mm 7.4 ± 1.7 mm 22.8 ± 3.6 mm
Patellar tendon	AP diameter prox attachment	<3mm >5mm = sever t'pathy
Placenta	Thickness midpoint insufficiency with reduced volume	>2cm "cupcake" appearance
Plantar plate	Metatarsal	20 x 9 x 2mm
Polyhydramnios[v]	AFI Deepest Pocket (SDP) Diamniotic Pregnancy (SDP)	>25cm >8cm >7.5cm
Popliteal artery stenosis	>50% >70%	PSV x 2 PSV x 3 or PSV > 200
Portal Hypertension Congestion Index	ratio between the cross-sectional area (cm2) and the blood flow velocity (cm/sec) of the portal vein[vi]	<0.1 NORMAL >0.1 possible PHT >0.15 PORTAL HYPERTENSION
Portal Vein	Normal calibre Normal Velocity (hepatopetal) suggestive of PHT Severe PHT	<13mm >40 <30 reversed flow
Posterior interosseus nerve[vii]	Entrapment at arcade of Frohse (level of supinator)	Normal average 1.1mm entrapped average 0.7mm
Posterior tibial tendon	Normal width	4-6mm
Pregnancy Failure	MSD	>25mm (TV)
Pregnancy Failure	For CRL >7mm	NO FHM
Prostate	Size	4x4x3cm

Prostate	Volume	<30cc
Pylorus	Neonate max canal length	14mm
Pylorus	Muscle width max	3mm
Renal Artery Stenosis (direct)	> 60% stenosis beware occluded RA	PSV >250; RAR > 3.5; post-stenotic turbulence
Renal Artery Stenosis	50-60% (borderline significance)	180-250cm^{s}, RAR>3.0-3.5
Renal Artery Stenosis (indirect)	> 60% stenosis -LESS SENSITIVE than DIRECT	AT >60 ms; AI<3.0m/s^{2}; R/L waveform asymmetry; RI <0.45
Resistive Indices KIDNEYS	Acute Obstruction or tubulointerstitial disease NORMAL in nephritis or chronic obstruction	>0.7 or difference of >0.10 side-side
Renal Vein (left)	Nut-cracker syndrome	Peak velocity > 80
Rotator cuff	mean thickness	3.9-6.6mm (men) 3.6-6.2mm (women)
Sacroiliac joint	Resistive index (AJR 9/99:677) sacroiliitis	0.91 +-0.09 0.62 +-0.13
Skull (neonatal) (AJR 97;168:819-21)	Lambdoid suture Coronal Sutures Sagittal	0.55-1.35mm 0.55-1.25mm 0.65-1.21mm
Submandibular Gland	anterior-posterior length, 35 ± 5.7 mm; paramandibular extension to gland depth, extension in frontal scanning	30-40mm 9-20mm 29-39mm
SMA stenosis	Poor sensitivity	PSV > 275 EDV>100 when severe SMA/Ao > 3.5
Spleen size	Less than (max 13cm any age)	1/3rd AGE + 6
Subarachnoid space	Neonatal brain (normal Sino-cortical width)) Benign External Hydrocephalus* External Hydrocephalus **also check interhemispheric gap (<5mm) and cortical veins not displaced*	<5mm <10mm >10mm
Testicle	Length x AP x trans	3-5cm x 2-3 x 2-3

Testicle	Volume	16-20mls
Thyroid	Volume	6-14mls
Tibialis posterior tendon[viii]	AP x trans AP:Transverse ratio	1.8-4.4mm x 8.1-13mm <0.45
Twin-Twin Transfusion Syndrome	MA/DA pregnancy	Oligohydramnios in one sac and polyhydramnios in the other
Ulnar nerve	At medial epicondyle (ellipse tool)	<0.06 cm^2
Umbilical Artery doppler	MCA:UA S/D ratio (<1 = foetal distress)	>1.0
Umbilical Artery RI	26 weeks 30 weeks 36-40 weeks	<5.0 **NORMAL** <4.0 <3.0
Ureters	Normal	<6mm
Uterine Artery PI	Low resistance waveform An early diastolic notch after 24 weeks is ABNORMAL (on either side)	PI <2.0 at <20 weeks PI<1.8 at 24-30 weeks PI<1.5 at >30 weeks
Uterine wall in pregnancy	35-38 weeks at site LSCS HIGH risk of rupture	>3mm <2.3mm
Uterus	Endometrial thickness pre-menopause	<8mm (proliferative) <15mm (secretory)
Uterus	Endometrial thickness post-menopause oestrogen phase of cyclical HRT progesterone phase of cyclical HRT continuous oestrogen & progesterone asymptomatic PM on tamoxifen	<5mm <15mm <5mm <6mm <6mm
Uterus	Size (average adult)	8x3x6 cm
Uterus length	Neonate Infant	2.3-4.6 2.5-3.3
Vascular Malformation	Paediatric	High flow, definable masses require further Ix. Low flow most likely haemangioma
Ventricle 4th	Foetal 2nd trimester (larger at term)	<2mm
Ventriculomegaly	Occipital horn (all ages gestation)	<10mm

Ventriculomegaly	Lat-Ventricle / hemisphere ratio	<75% (16 weeks) <35% (25 weeks)

References

[i] Shaalan WE et al. J Vasc Surg 2008 Jul;48(1):104-112.

[ii] J Vasc Surg 2008 Jan;47(1):63-73

[iii] Agathokleous et al: Second trimester screening for trisomy 21. *Ultrasound Obstet Gynecol* 2013; **41**: 247–261.

[iv] C. Gunay & H. Atalar & H. Dogruel & O. Y. Yavuz & I. Uras & U. Sayl*ı:* Correlation of femoral head coverage and Graf *α* angle in infants being screened for developmental dysplasia of the hip. International Orthopaedics 2008.

[v] Dubil E and Magann E. AJUM 2013;16(2):62-70.

vi Adapted from Moriyasu F et al: Congestion index of the portal vein. AJR Am J Roentgenol. 1986 Apr;146(4):735-9.

vii Dong Q et al.J Ultrasound Med 2010;29:691-6

viii Premkumar et al. AJR2002;178:223-232