

Medical Reference Cards

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Adrenal Venous Sampling

Introduction: Primary aldosteronism (PA) is more common than previously thought. Up to 15% of all hypertension is due to PA. PA can be caused by bilateral or unilateral hyperplasia, an adenoma, or by mutations in genes coding for enzymes involved in aldosterone (AS) synthesis. **Adrenal venous sampling (AVS)** is a procedure used to diagnose the **source** of the excess aldosterone (i.e. whether it is uni- or bilateral). Why is this important? Because unilateral PA is treated surgically, whereas bilateral PA is managed medically. AVS is, by far, the most reliable way of establishing the source of excess AS.

The procedure: With AVS, the difference between left and right adrenal AS excretion is measured by sampling blood from each **adrenal vein (AV)**. This is more complicated than it sounds, mostly for anatomical reasons. The **right adrenal vein** is very short and originates directly from the **inferior vena cava (IVC)**, making it very difficult to cannulate. The **left AV** originates from a common trunk with the inferior phrenic vein (IPV), which, in turn, originates from the left renal vein. The common trunk is easier to cannulate than the left AV itself, but dilution from the IPV must then be compensated for when interpreting the AS level (in the common trunk, left AV blood is mixed with IPV blood, which obviously has a lower AS concentration).

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Execution: The **right AV**, **IVC**, and **left AV** are cannulated, and blood is sampled for analysis of **AS** and **cortisol** levels. The AVs are catheterized through the percutaneous femoral vein approach. Gentle contrast injections are used to verify the position of the catheter tip.

- Why is blood sampled from the IVC? Why is the cortisol level analyzed? Aren't we only interested in the AS levels? These questions are answered in the interpretation section.

Interpretation: Ultimately, we're interested in whether there's a significant difference between AS levels in the two adrenal veins. So why cannulate the IVC? Because comparing the right AV and IVC cortisol levels tells us whether or not the difficult cannulation was successful – the cortisol level should be **≥3 higher** in the right AV. If this is the case, we can trust subsequent measurements.

Before AS levels are compared, we must account for dilution. This is done by dividing the AS level with the cortisol level in each AV – the ratio will be the same regardless of dilution. These **corrected** values (A/C ratios) are the ones used in the final comparison.

If the A/C ratio of one adrenal vein is ≥ 4 times higher than that of the other, the source of AS is unilateral and should be treated **surgically**.

C-ABCDE

C Catastrophic bleeding / Cardiac arrest

A Airways

- Check airway
 - Thorax movement
 - See, listen, feel
 - Paradox. breathing?
 - Stridor?
1. Chin lift/Jaw thrust
 2. Naso/Oropharyngeal airway
 3. Suction
 4. Laryngeal mask airway
 5. Intubation
 6. Coniotomy

B Breathing

- Respiratory rate
 - Thorax movement
 - Auscultation
 - Cyanosis
1. Oxygen
 2. Ventilation
 3. Decompression
 4. Chest tube

C Circulation

- Colour (Pale)
 - Cold/Sweaty
 - Pulse (Rad / Fem / Car)
 - Abdomen/Pelvis
1. Tilt bed
 2. Fluids (PVC, IO, CVC)
 3. Vasoactive drugs (Adrenalin IM)

D Disability

- AVPU/GCS
 - Pupils
 - Movement of extrem.
1. Support ABC
 2. Glucose
 3. Antidote

E Exposure

- Check whole body
 - Prevent hypothermia
 - Prevent further injury
1. Log roll
 2. Warm blankets
 3. Warm fluids

SBAR

S Situation

Own name, title, and unit
Patients name, sex, and age
Patients social security / identification number
Describe situation briefly
I'm contacting you to...

B Background

Previous and current illness
Relevant medical history
Allergies
Contagiousness

A Assessment

A: Airway
B: Breathing, saturation
C: Heart rate, blood pressure
D: Consciousness, pain, oriented to time / place / person
E: Temperature, skin, colour, abdomen, urine production

Brief assessment

R Recommendation

Immediate action (Care, monitoring, transfer, treatment)
Further examinations (Radiology)
Time frame (How often...? How long...? Next contact...?)

Confirmation of communication
Questions / Agreement

Lab reference (Swe)

Sys.	Component	Subgroup	Ref. interval	Unit
P/S	ALAT	Male	0,15 – 1,1	µkat/L
		Female	0,15 – 0,75	µkat/L
P/S	ALP		0,60 – 1,8	µkat/L
P/S	Amylas		0,40 – 2,0	µkat/L
P/S	Albumin	18 – 40 y.	36 – 48	g/L
		41 – 70 y.	36 – 45	g/L
		>70 y.	34 – 45	g/L
P/S	ASAT	Male	0,25 – 0,75	µkat/L
		Female	0,25 – 0,60	µkat/L
P/S	Bilirubin		5 – 25	µmol/L
P/S	Calcium		2,15 – 2,50	mmol/L
P/S	CK	Male 18 – 50 y.	0,80 – 6,7	µkat/L
		Male >50 y.	0,70 – 4,7	µkat/L
		Female	0,60 – 3,5	µkat/L
P/S	Fosfat	Female	0,80 – 1,5	mmol/L
		Male 18 – 50 y.	0,70 – 1,6	mmol/L
		Male >50 y.	0,75 – 1,4	mmol/L
fP	Glukos		4,2 – 6,3	mmol/L
P/S	GT	Male 18 – 40 y.	0,15 – 1,3	µkat/L
		Male >40 y.	0,20 – 1,9	µkat/L
		Female 18 – 40 y.	0,15 – 0,75	µkat/L
		Female >40 y.	0,15 – 1,2	µkat/L
P/S	Järn		9 – 34	µmol/L
P/S	Järnmättnad	Male	0,15 – 0,60	
		Female 18 – 50 y.	0,10 – 0,50	
		Female >50 y.	0,15 – 0,50	
P	Kalium		3,5 – 4,4	mmol/L
S	Kalium		3,6 – 4,6	mmol/L
P/S	Kolesterol	18 – 30 y.	2,9 – 6,1	mmol/L
		31 – 50 y.	3,3 – 6,9	mmol/L
		>50 y.	3,9 – 7,8	mmol/L
P/S	HDL-Kolesterol	Female	1,0 – 2,7	mmol/L
		Male	0,80 – 2,1	mmol/L

Lab reference (Swe)

Sys.	Component	Subgroup	Ref. interval	Unit
P/S	LDL-Kolesterol	18 – 30 y.	1,2 – 4,3	mmol/L
		31 – 50 y.	1,4 – 4,7	mmol/L
		>50 y.	2,0 – 5,3	mmol/L
P/S	Kreatinin	Male	60 – 105	µmol/L
		Female	45 – 90	µmol/L
P/S	LD	18 – 70 y.	1,8 – 3,4	µkat/L
		>70 y.	1,9 – 4,2	µkat/L
P/S	Magnesium		0,70 – 0,95	mmol/L
P/S	Natrium		137 – 145	mmol/L
P/S	Pankreasamylas		0,15 – 1,10	µkat/L
P/S	Protein		64 – 79	g/L
P/S	TIBC		47 – 80	µmol/L
P/S	Triglycerider		0,45 – 2,6	mmol/L
P/S	Urat	Male	230 – 480	µmol/L
		Female 18 – 50 y.	155 – 350	µmol/L
		Female >50 y.	155 – 400	µmol/L
P/S	Urea	Male 18 – 50 y.	3,2 – 8,1	mmol/L
		Male >50 y.	3,5 – 8,2	mmol/L
		Female 18 – 50 y.	2,6 – 6,4	mmol/L
		Female >50 y.	3,1 – 7,9	mmol/L
B	Hemoglobin	Female	117 – 153	g/L
		Male	134 – 170	g/L
B	EVF	Female	0,350 – 0,458	
		Male	0,393 – 0,501	
B	Erytrocyter	Female	3,94 – 5,16	1012/L
		Male	4,25 – 5,71	1012/L
B	MCV		82 – 98	fL
Erc	MCH		27,1 – 33,3	pg
Erc	MCHC		317 – 357	g/L
B	Leukocyter		3,5 – 8,8	109/L
B	Trombocyter	Female	165 – 387	109/L
		Male	145 – 348	109/L

CHA2DS2VAS

C	Cardiac - Heart failure	1
H	Hypertension	1
A	Age ≥ 75 years	2
D	Diabetes	1
S	Stroke/TIA/embolism	2
V	Vascular Atherosclerotic disease	1
A	Age 65-74	1
S	Sex - Female*	1

*No indication for antithrombotic treatment if only risk factor

**AF and score $\geq 2 \rightarrow$ Antithrombotic treatment
IF low-medium risk of bleeding (HAS-BLED <3)**

See local guidelines for specific antithrombotic drugs

Example of initial Warfarin treatment, 2.5mgx1 p.o.

Day 1: 2-4 | Day 2: 2-3 | Day 3: 1-4 (dep. on INR)

HAS-BLED

H	Hypertension >160 mmHg	1
A	Abnormal liver or kidney function*	1-2
S	Stroke	1
B	Bleeding Previous tendency or anaemia	1
L	Labile INR High/unstable INR or $<60\%$ time in therapeutic range	1
E	Elderly (>65 years)	1
D	Drugs E.g. ASA, NSAID or high alcohol consumption	1-2

* Kidney: Creatinine >200 , dialysis, or transplant
Liver: Chronic liver disease, Bilirubin 2x ref, or
ALAT/ASAT/ALP 3x ref.

High risk of bleeding if ≥ 3 points

Neurological exam.

The whole time

Psychiatric: Wakefulness, oriented to time/place/self
 Motor: Facial expressions, general
 Dysarthria, dysphasia, right or left handed
 Higher cortical functions: Apraxia, spatial function, neglect

Standing

Walk across the room
 Walk on toes/heels
 Squat and rise
 Sight and hearing

Sitting

Face: Symmetry, ptosis, corneal reflex
 Pupils: Size, reaction to light
 Eye movements: Nystagmus, diplopia
 Sight: Donder's test
 Mouth and throat: Symmetry, swallow reflex, gingival hyperplasia, cranial nerve XII
 Sensibility to light touch, vibration, temperature, and pain
 Motoric function for cranial nerve V, VII, XI
 Reflexes in arms and legs
 Grasset's test
 Auscultation of lungs
 Palpate lymph nodes
 (Smell and taste)

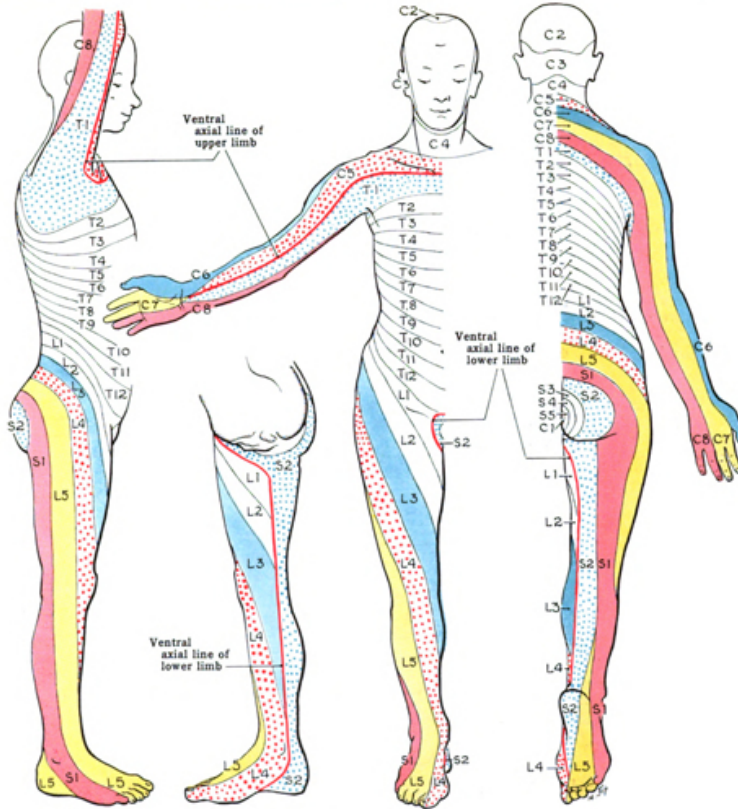
Lying down

Neck stiffness
 Muscle strength: proximal + distal, in arms and legs
 Muscle tone, atrophies, fasciculation, tremor,
 Heel-knee test
 Dysdiadochokinesis
 Abdominal reflexes
 Barré's test
 Babinski's sign
 Fundus examination
 (Primitive reflexes: Grasping reflex, palmomental, glabellar, sucking)

Glasgow Coma Scale

	Response	Score
Eye opening response	Spontaneously	4
	To speech	3
	To pain	2
	No response	1
Best verbal response	Oriented to time, place, and person	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	No response	1
Best motor response	Obeys commands	6
	Moves to localized pain	5
	Flexion withdrawal from pain	4
	Abnormal flexion (decorticate)	3
	Abnormal extension (decerebrate)	2
Total score	No response	1
	Best response	15
	Comatose patient	≤8
	Totally unresponsive	3

Dermatomes



Myotomes

Segment Function

C1/C2	Neck flexion/extension
C3	Neck lateral flexion
C4	Shoulder elevation
C5	Shoulder abduction
C6	Elbow flexion/wrist extension
C7	Elbow extension/wrist flexion
C8	Finger flexion
T1	Finger abduction
L2	Hip flexion
L3	Knee extension
L4	Ankle dorsi-flexion
L5	Great toe extension
S1	Ankle plantar-flexion/ankle eversion/hip extension
S2	Knee flexion
S3-S4	Anal wink

Distal Status - Hand

Inspection

Hematomas / Wounds

Malalignment / Tonus

Palpation

Fossa tabatière

Distal radioulnar joint

Circulation

Allen's test – Ulnar / Radial loss of circulation

Capillary refill Dig I-V

Passive movement (tendons)

Finger extension, each separately

Flexor digitorum superficialis et profundus, separately

Neurology

1. *Radialis* 2. *Medianus* 3. *Ulnaris*

Sensory			Motor
	1. Dig I, radially 2. Dig II, distal of PIP 3. Dig V, ulnar side	1. Extension of fingers 2. Opposition, Dig I & V 3. F.spread / Dig V flex.	

Stability

Dig I, MCP, UCL, Distal radioulnar joint

Watson's test – Instability, scaphioidum - lunatum

Specific tests

Tinel's and Phalen's tests: carpal tunnel syndrome

Finkelstein's test: Morbus de Quervain

Pain in wrist should result in plain film x-ray

- Empty -

Ottawa Ankle Rule

1 Pain around the malleolus AND

Palpation tenderness over the dorsal ridge of the lateral or medial malleus

OR

Inability of the foot to support four steps

2 Pain around the mid part of the foot AND

Palpation tenderness over the base of the 5th metatarsal bone OR the Navicular bone

OR

Inability of the foot to support four steps

X-ray of foot and lower leg if 1 or 2 are met

Otherwise: Elastic wrap, tape, possibly orthosis, information (proprioceptive exercises e.g. stand on one leg while brushing teeth)

Acute care (PRICE)

Protection, Rest, Ice, Compression, Elevation

Only applicable on adults (>18 years) with isolated injury

Well's DVT Score

Sign	Point
Active cancer last 6 months	1p
Paralysis, paresis, newly casted	1p
Immobilized >3 d. or large surgery last 4 w.	1p
Localized tenderness along the deep venous system	1p
Whole leg swelling	1p
Calf circumference >3 cm, compared to asymptomatic side	1p
Pitting oedema on symptomatic side	1p
Collateral flow in superficial veins (non-varicose)	1p
Similar likelihood of alternative diagnosis	-2p

Low points <2 + negative D-dimer
= low probability for DVT

High points ≥ 2 → Ultrasound whole leg

Risk of false negative D-dimer when symptoms >1w or anticoagulation therapy

Normal Physiology

Age	RR (/min)	HR (/min)	SBP (mmHG)
0-1 m	30-60	110-160	65-90
1-12 m	30-40	110-160	70-90
1-2 y	25-35	100-150	85-35
2-5 y	25-30	95-140	80-110
5-12 y	20-25	80-120	90-110
>12 y	15-20	60-100	100-120

Age	♀ W. (kg)	♀ H. (cm)	♂ W. (kg)	♂ H. (cm)
0 m	2.8-4.2	46-54	2.9-4.4	47-55
3 m	4.6-7.0	56-64	4.8-7.5	57-66
6 m	6.0-9.3	62-71	6.4-10	63-73
1 y	8.0-12	70-80	8.5-13	71-82
5 y	15-25	102-120	15.5-25	110-112
18 y	46-80	156-180	55-94	167-194

Age (m)	1-2	2-4	4-6	6-8	8-10	10-12
W. gain (g/w)	175	150	125	100	75	50

W. (kg)	Fluids (ml/kg/24h)	A. (y)	ml/kg/hour
2-8	150	0-1	2-4
6-10	115-120	>1	1-2
0-10	100	▲ Urine / Oliguri ▼	
10-20	50	0-1	<1
>20	20	>1	<0.5

Holiday-Segar

Normal Physiology

Months	Gross motor	Fine motor	Cogn. & Comm.
1-2	Lift head when prone	-	Smile in resp. to face/voice, visual preference for human face
2-3	Head steady in sitting	-	-
3-4	Lift head & chest w. ext. arms	Grasp rattle	Sustain contact, displeasure if soc. contact broken, "aah, ngah"
5-6	Roll over	Transfer objects hand to hand	Monosyllabic babble
6-7	Sit with support	-	Polysyllabic babble, vowel sounds, enjoys mirrors
7-8	Sit without support, crawl	Thumb-finger grasp	Suspicious/afraid of strangers
9-10	Pull to standing pos., walk holding furniture	Pincer grip, bang objects together.	Play peek-a-boo, wave bye-bye, respond to own name
12-18	Walk alone	Turn pages in book, scribble, build 2-cube tower	Speak a few words
4 yrs.	Walk on a straight line, jump on one leg	Button clothes	Answer questions, understand prepositions