Pediatric chronic pain

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WHO Guideline for the management of chronic pain in children

- Pain in children is a public health concern of major significance in most parts of the world. For many children, this pain is chronic. Chronic pain is experienced by about a quarter to a third of children ,with about 1 in 20 experiencing debilitating pain .As the leading cause of morbidity in children and adolescents in the world today, chronic pain is a major health concern.

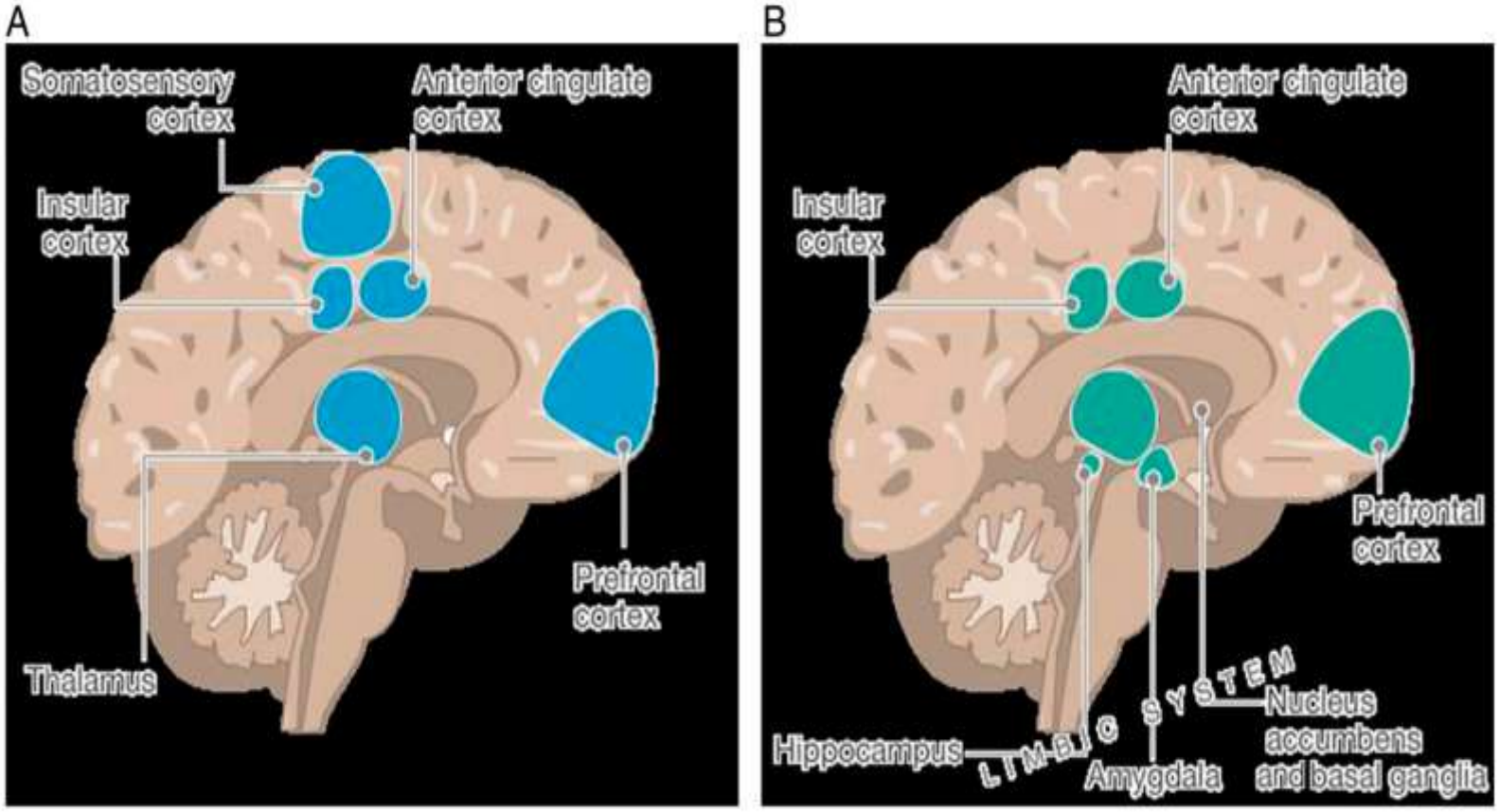
- The 11 the revision of the International Classification of Diseases (ICD-11) categorizes
- chronic pain as follows:
- - Chronic primary pain
- - Chronic cancer-related pain
- - Chronic postsurgical or post traumatic pain
- - Chronic secondary musculoskeletal pain
- - Chronic secondary visceral pain
- - Chronic neuropathic pain
- - Chronic secondary headache or orofacial pain

- The prevalence of CP increases with age and more advanced pubertal development, and there is a female preponderance. High rates are reported for idiopathic pain (eg, headache [23%–51%], functional abdominal pain [1.6%–41.2%], back pain [14%–24%], and musculoskeletal pain [4%–40%]), with a median prevalence of 11% to 38% in community surveys.

- Chronic primary pain is characterized by significant emotional or functional disability and is diagnosed independent of identified biological or psychological contributors. Non-primary or “secondary” pain diagnoses is pain caused by a clear underlying aetiology such as a disease, injury, lesion or their treatment .Initial theories behind the origin of pain included the “gate theory” that described nociceptors and touch receptors. When painful stimuli reaches a specific intensity, a gate opens and activate pathways leading to pain being experienced . This was later augmented with sensory-discriminative, affectivemotivational and cognitive-evaluative components in a biomedical model of pain .

- Pain in children differs to that in adults ,due to immaturity in the anatomical expression of neurotransmitters and neuromodulators, developmental potential, plasticity of the central nervous system and psychosocial milieu .Exposure to chronic pain in early life have implications on the incidence, severity and duration of chronic pain, and for long term maladaptive neurologic changes .Yet, despite these differences, pharmacologic management of adult pain is often extrapolated downward to the paediatric population even when this management was not intended to be given to children. In part, this is due to the obvious lack of evidence for pharmacologic management of pain in children .

- Using data from the US National Longitudinal Study of Adolescent to Adult Health (with almost 15,000 participants), Groenewald and colleagues showed adults with a history of adolescent chronic pain were more likely to misuse opioids than those without history of chronic pain, even after controlling for other known risk factors.


A
Somatosensory cortex
Anterior cingulate cortex
Insular cortex
Prefrontal cortex
Thalamus
B
Anterior cingulate cortex
Insular cortex
Prefrontal cortex
Hippocampus
LIMBIC SYSTEM
Amygdala
Nucleus accumbens and basal ganglia

- Human functional brain imaging studies indicate that CP conditions preferentially engage medial prefrontal cortical areas as well as subcortical limbic regions, especially portions of the dorsal and ventral basal ganglia, amygdala, and hippocampus. Even though different types of CP, and different perceptions in individual patients, seem to engage distinct cortical and subcortical regions, overall across CP conditions there is generally a shift away from brain regions engaged in processing the sensory component of pain toward regions that encode emotional and motivational subjective states
- These areas are also strongly associated with functions that include learning, memory, and emotional responses and thereby are believed to relate to the cognitive and emotional problems commonly experienced by patients with CP, such as anxiety and depression, impaired emotional decision-making, working memory, and difficulty in performing classic conditioning tasks.

THE ASSESSMENT OF CP

TABLE 1 Examples of Published Instruments for Assessing Young People Grouped Within the Biological Psychological and Social Domains of Relevance to CP

Domain		Construct	Example Instrument (Age Range, y)
Biological	Pain symptom	Pain intensity	VAS (10), NRS, VRS (>7)
			FPSS-R[67] (4–7), Electronic Pain Diaries[68]
		Pain characteristics	LANSS[69] (not currently standardized for children)
		Pain distribution	Body maps[70]
		Combination: intensity/distribution/quality	Varni/Thompson Pediatric Pain Questionnaire[71] (5–18)
	Comorbid symptoms	Fatigue	PedsQL (MFS) (0–18) (parent and child report)
		Functional status	FDI[72]
		Quality of life	PedsQL[73] (0–18)
		Sleep disturbance	CSHQ[74] (4–10)
Psychological	Emotional functioning	Depression	CDI[75] (7-17)
			RCADS[76] (6-18)
		Anxiety	STAIC[77] (8–12)
			STAI[78] (≥16)
			RCADS[79] (6–18)
		Anger	STAXI–2 C/A[80] (9–18)
			STAXI-2[78] (≥16)
		Combination: anxiety/depression	PI-ED[81] (8–18)
		Anxiety disorders (separation anxiety, generalized anxiety, panic, social phobia, obsessions-compulsions) and depression	RCADS[76] (6–18)
	Cognitions	Coping strategies	PCQ[82] (8–17)
		Catastrophizing	PCS-C[83] (8–17)
		Self-efficacy to manage pain	PSEQ[84] (not currently standardized for children)
Social	Environmental/Social	Family functioning	PSI-SF[85]
		Parental catastrophizing	PCS-P[86]
		Parental anxiety	BAI[78]
			STAI[87]
			HADS[88]
		Parental depression	BDI II[89]
			HADS[88]

TABLE 2 SOCRATES Mnemonic: A Frequently Recommended Resource to Guide Initial Questioning in CP Assessment

Site	Where is the pain?
Onset	When did the pain start, and how did it first appear?
	Did the pain appear suddenly or developed over time?
	What were you doing when it started?
Character	What words would you use to describe the pain?
	Is it stabbing, sharp, aching, burning, shooting, hot, cold?
Radiation	Does the pain move elsewhere in the body?
Associations	Are there any symptoms, signs, or activities associated with the pain?
	Is it associated with bruising, swelling, nausea, or high temperatures? Does it always come on at certain times; for example, at meal times or when you are doing a particular activity?
Timing	Is the pain spontaneous or evoked?
	Constant, intermittent, or both?
	Background pain?
	Acute exacerbations?
	For how long have you had the pain and has it changed over time?
Exacerbating or relieving factors	What makes the pain better or worse?
	Response to previous treatments?
Severity	How intense is the pain?
	Does it stop you doing any of the things you like or need to do?
	What do you do when you have pain?
	Is there anything you avoid doing as a result of the pain?
	In what ways has your life changed since you developed pain?

TABLE 4 Red Flags in Pediatric CP

Young age at presentation
Systemic upset
Fever
Malaise
Weight loss
Rashes
Lymphadenopathy
Hepatosplenomegaly
Pain that wakes at night
Bone pain
Joint swelling
Impaired growth and development
Neurologic signs
Depression, evidence of suicidal ideation or major psychiatric disorder
Suspicion of child abuse (eg, incongruence between history and presentation or pattern of physical findings)

Pharmacologic treatment of pain

- Considerations in treating infants and children. During the
- treating of pain in infants it is important to understand that
- although most of the major organ systems are anatomically
- well developed at birth, their functional maturity is often
- delayed. In the first months of life, in both preterm and
- full-term newborns, these systems rapidly mature, most
- approaching a functional level similar to adults before 3
- months of age.

- nephrons begin forming
- in uteroat 9 weeks, formation is complete at 36 weeks, but
- functionally immature, GFR have a range of only ½ of adult
- values at birth, tubular secretion rate is only 20% of adult
- capacity. A less frequent dosing interval is needed to avoid
- accumulation and toxicity.

WHO recommendations

- for the correct use of analgesic medicines in children relies
- on the following key concepts [43, 50]:
- • using a two-step strategy;
- • dosing at regular intervals;
- • using the appropriate route of administration;
- • adapting treatment to the individual child.

Step1: paracetamol and ibuprofen

- In children above three months of age who can take oral medication and whose pain is assessed as being mild, paracetamol and ibuprofen are the medicines of choice.
- For children below three months of age, the only option is paracetamol.
- Why ibuprofen :No other non-steroidal anti-inflammatory drug (NSAID) has been sufficiently studied in paediatrics for efficacy and safety to be recommended as an alternative to ibuprofen.

Table 1. Opioid analgesics for the relief of pain in neonates, infants and children recommended by WHO [43]

	Dose (oral route)			
Medicine	Neonates from 0 to 29 days	Infants from 30 days to 3 months	Infants from 3 to 12 months or child from 1 to 12 years	Maximum daily dose
Paracetamol	5–10 mg/kg every 6–8 hours [a]	10 mg/kg every 4–6 hours [a]	10–15 mg/kg every 4–6 hours [a,b]	Neonates, infants and children: 4 doses/day
Ibuprofen			5–10 mg/kg every 6–8 hours	Child: 40 mg/kg/day

a Children who are malnourished or in a poor nutritional state are more likely to be susceptible to toxicity at
standard dose regimens due to reduced natural detoxifying glutathione enzyme.
b Maximum of 1 gram at a time.

Table 2. Recommended by WHO starting dosages for opioid analgesics for opioid-naive neonates [43]

Medicine	Route od Adminis-tration	Starting dose
Morphine	IV injection[a]	25–50 mcg/kg every 6 hours
	SC injection	
	IV infusion	Initial IV dose[a] a 25–50 mcg/kg, then 5–10 mcg/kg/hour 100 mcg/kg every 6 or 4 hours
Fentanyl[b]	IV injection	1–2 mcg/kg every 2–4 hours
	IV infusion	Initial IV dose[c] 1–2 mcg/kg, then 0.5–1 mcg/kg/hour

[a] Administer IV morphine slowly over at least 5 minutes.
[b] The intravenous doses for neonates are based on acute pain management and sedation dosing information. Lower doses are required for non-ventilated neonates.
[c] Administer IV fentanyl slowly over 3–5 minutes

Table 4. Starting dosages for opioid analgesics in opioid-naive children (1–12 years) according to WHO recommendations [43]

Medicine	Route od Administration	Starting dose
Morphine	Oral (immediate release)	1–2 years: 200–400 mcg/kg every 4 hours 2–12 years: 200–500 mcg/kg every 4 hours (max 5 mg)
	Oral (prolonged release)	200–800 mcg/kg every 12 hours
	IV injection[a]	1–2 years: 100 mcg/kg every 4 hours 2–12 years: 100–200 mcg/kg every 4 hours (max 2.5 mg
	SC injection	
	IV Infusion	initial IV dose : 100–200mcg/kg[a], then 20–30 mcg/kg/hour
	SC infusion	20 mcg/kg/hour
Fentanyl	IV injection	1–2 mcg/kg[b], repeated every 30–60 minutes
	IV infusion	Initial IV dose 1–2 mcg/kg[a], then 1 mcg/kg/hour
Hydro-morphone[c]	Oral (immediate release)	30–80 mcg/kg every 3–4 hours (max 2 mg/dose)
	IV injection[d] or SC injection	15 mcg/kg every 3–6 hours
Methadone[e]	Oral (immediate release)	100–200 mcg/kg every 4 hoursfor the first 2–3 doses, then every 6–12 hours(max 5 mg/dose initially)[f]
	IV injection[g] and SC injection	
Oxycodone	Oral (immediate release)	125–200 mcg/kg every 4 hours(max 5 mg/dose)
	Oral (prolonged release)	5 mg every 12 hours

Table 3. Starting dosages for opioid analgesics in opioid-naive infants (1 month – 1 year) according WHO recommendations [43]

Medicine	Route od Administration	Starting dose
Morphine	Oral (immediate release)	80–200 mcg/kg every 4 hours
	IV injection[a]	1–6 months: 100 mcg/kg every 6 hours 6–12 months: 100 mcg/kg every 4 hours (max 2.5 mg /dose)
	SC injection	
	IV infusion [a]	1–6 months: Initial IV dose: 50 mcg/kg, then: 10–30 mcg/kg/hour 6–12 months: Initial IV dose: 100–200 mcg/kg, then: 20–30 mcg/kg/hour
	SC infusion	1–3 months: 10 mcg/kg/hour 3–12 months: 20 mcg/kg/hour
Fentanyl[b]	IV injection	1–2 mcg/kg every 2–4 hours[c]
	IV infusion	Initial IV dose 1–2 mcg/kg[c], then 0.5–1 mcg/kg/hour
Oxycodone	Oral (immediate release)	50–125 mcg/kg every 4 hours

Goel

- There is no upper dosage limit for opioid analgesics because there is no ‘ceiling’ analgesic effect. The appropriate dose is the dose that produces pain relief for the individual child. The goal of titration to pain relief is to select a dose that prevents the child from experiencing pain between two doses using the lowest effective dose.

Side effect

- Constipation:, methylnaltrexone
- nausea : anti-emetics, such as a phenothiazine,
- butyrophenones, antihistamines, or a serotonin receptor antagonist, such as ondansetron or granisetron.
- Pruritus : IV naloxone .

Dosage increase

- The maximum dosage increase is 50% per 24 hours in outpatient settings. Experienced prescribers can increase up to 100% while monitoring the patient carefully .

Weaning opioids

- weaning opioids should be done slowly by tapering the opioid dose.
- For short-term therapy (7–14 days), the original dose can be decreased by 10–20% of the original dose every 8 hours, and gradually increasing the time interval.
- In the case of a long-term therapy protocol, the dose should be reduced not more than 10–20% per week .These pharmacological approaches should be accompanied by measurement of withdrawal symptoms using a special scoring system .

paediatric caudal anaesthesia

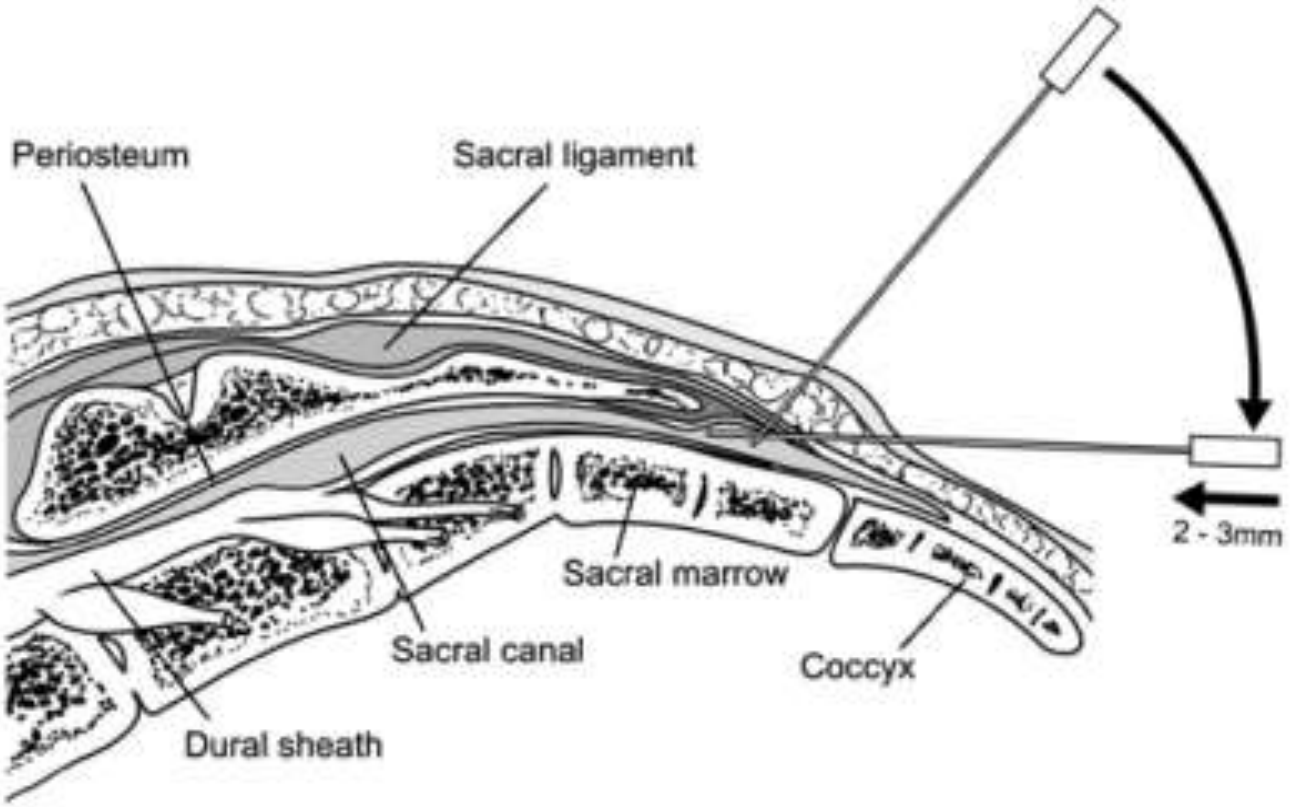
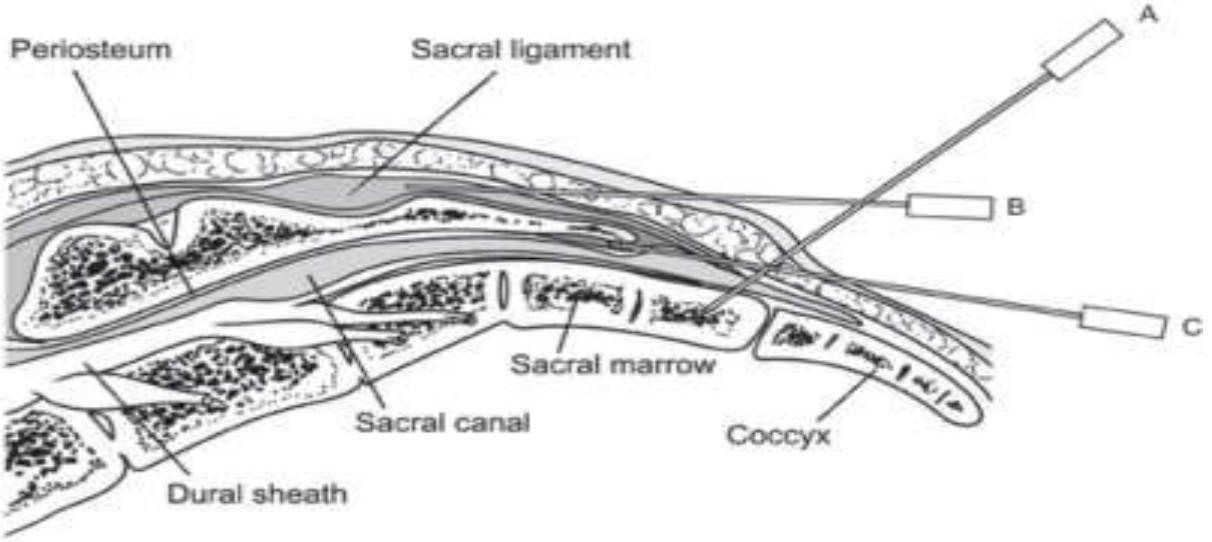
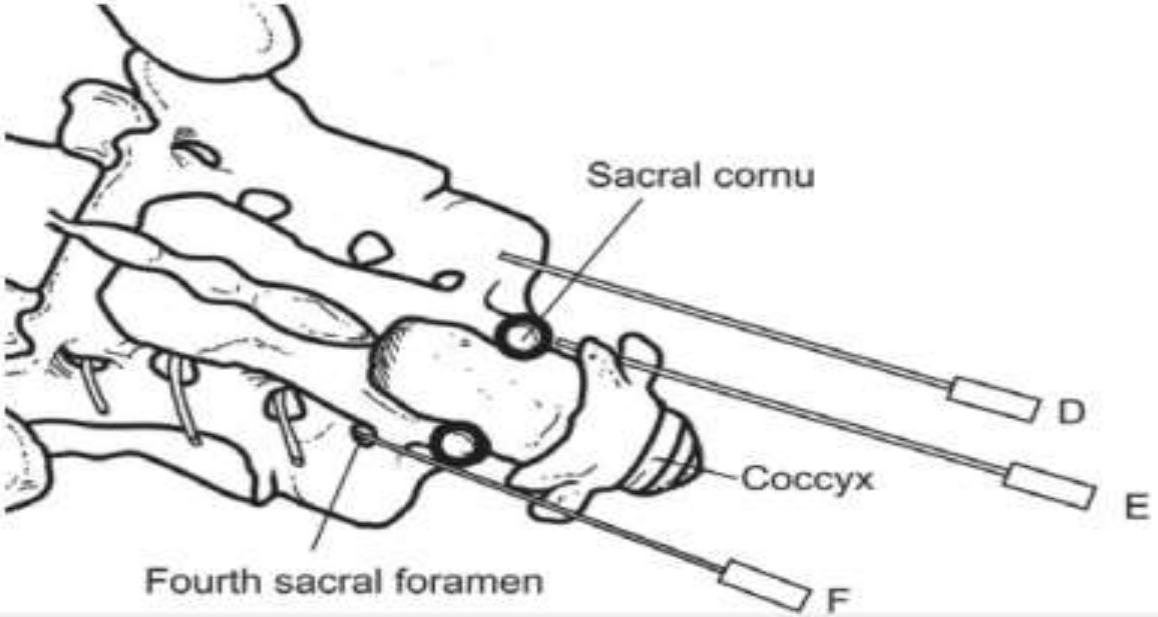


Figure 4. *Puncture - orientation of the needle and reorientation after crossing the sacro-coccygeal ligament*


Periosteum
Sacral ligament
A
B
C
Sacral marrow
Sacral canal
Coccyx
Dural sheath


Sacral cornu
D
Coccyx
E
Fourth sacral foramen
F

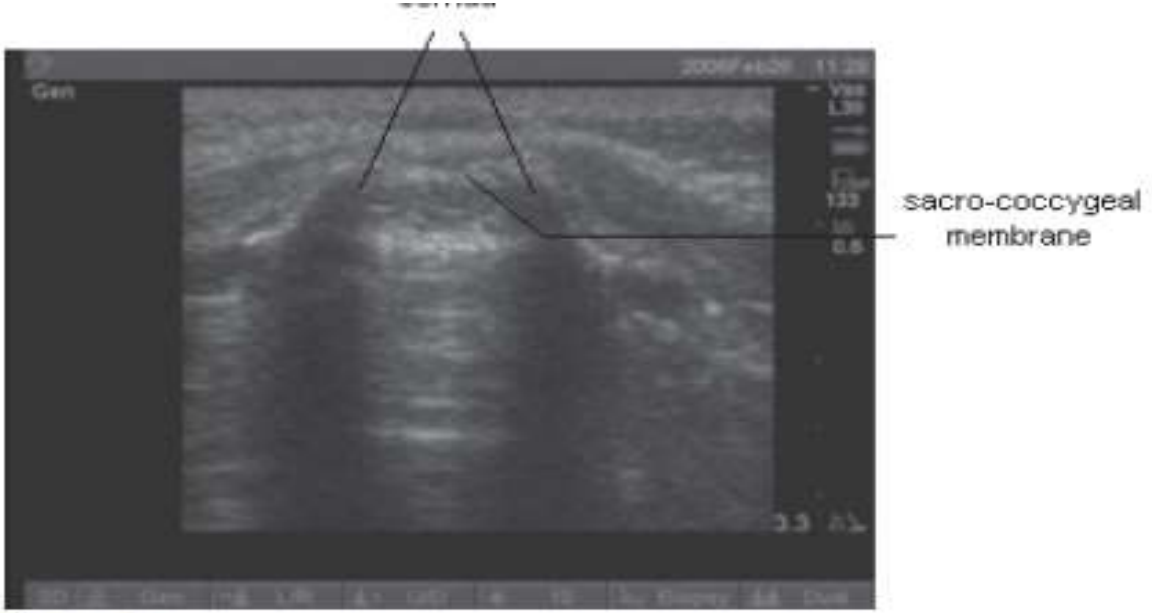
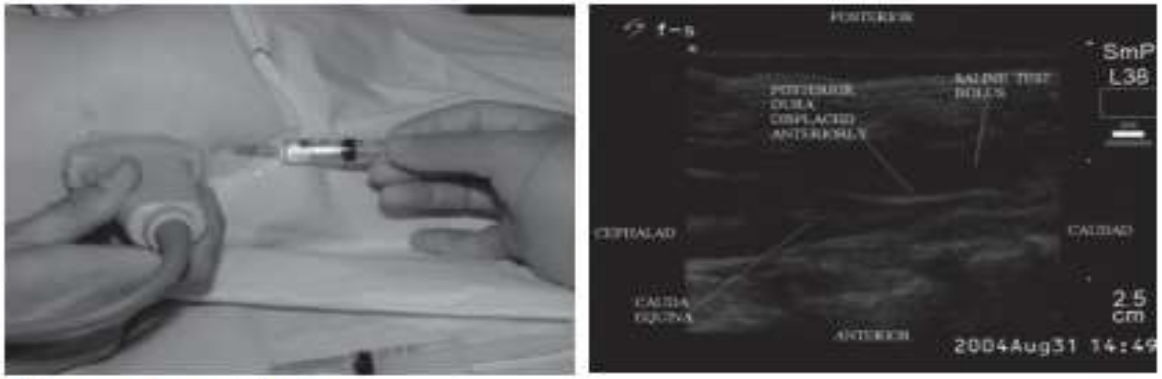


Figure 7.



Figures 8a and 8b.