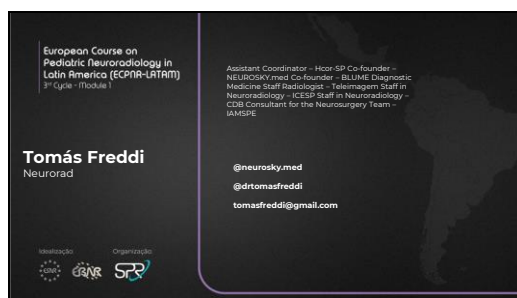


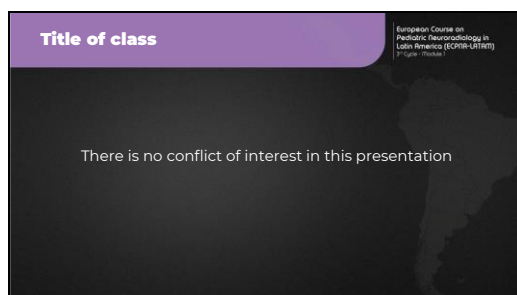
Slide 1



Slide 2



Slide 3



Slide 4

References

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A Practical Approach to Diagnosis of Spinal Dysraphism



International Consensus Statement on the Radiological Evaluation of Dysraphic Malformations of the Spine and Spinal Cord

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Slide 5

Introduction

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Spinal dysraphism

Congenital malformations of the spine and spinal cord.
Etymology: Dys = bad, Rhaphé = suture.

Slide 6

Key Terms

- Spina bifida = bone defect
- Neural placode = non-neurulated tissue
- Lipo = fat;
- Myelo = spinal cord;
- Meningo = meninges;
- Cele = cavity
- Tethered cord = clinical diagnosis (avoid in radiology reports)




Slide 7

Exam Technique

Fetal MRI:
2nd trimester, maternal comfort, T2 priority
Suggested protocol includes DWI, CISS, HASTE, VIBE, SWI, GRAPPA, CAIPIRINHA

Neonatal - infant MRI:
Routine protocol or perform the examination as quickly and objectively as possible



Slide 8

SEQUENCE	IMAGING PROTOCOL				
	DWI	T2 HASTE	SWI	T1 VIBE	CISS
TR	3000ms	1200	49	7	6
TE	80 ms	100	40	2	3
FOV	240mm	240	250	300	200
Slice Thickness	4mm	3	2	3	1.6
CAP	1mm	0	0.2	0.3	0.6
Flip Angle	180 deg	150	15	10	65
Fat Contrast	Fat Sat	NO	NO	DIXON	NO
Voxel Size	2.4 x 2.4 mm	0.5 x 0.5	11x11	1.4 x 1.4	0.6 x 0.6
Acceleration	YES	YES	NO	NO	NO
Bandwidth	GRAPPA	GRAPPA	CAIPIRINHA	CAIPIRINHA	NO
b-value	1000 s/mm	n/a	n/a	n/a	n/a


Abbreviations: DWI: Diffusion Weighted Imaging; CISS: Constructive Interference in Steady State; FOV: Field-of-view; HASTE: Half Fourier Acquired Single Shot Turbo Spin Echo; mm: millimeter; ms: millisecond; TE: echo time; FSE: turbo field echo; TR: thickness; TR: repetition time; CAIPIRINHA: Constructive Interference in Parallel Imaging; Results in High; Acceleration: GRAPPA: Generalized Autocalibrating Partial Parallel Acquisition; SWI: Susceptibility Weighted Imaging; VIBE: Volumetric Interpolated Breath-hold Examination; Note: Modifications of the parameters may be required for different MRI systems.

Childa Hervé-Gast, 2021-04-30(0)-2899-2927

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Exam Technique - Postop MRI

- Routine MRI of the spine
- Add, when feasible:
 - Sagittal CISS, FIESTA
 - DWI (b600-b800)
 - Post-contrast images



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Slide 10

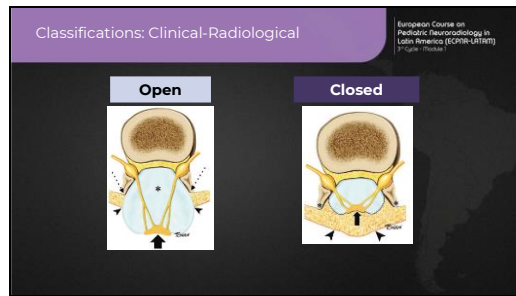
Técnica de Exame – RM pós-natal

European Course on Pediatric Neuroimaging in Latin America (ECPNR-LATAM)
3rd Cycle - Brasília

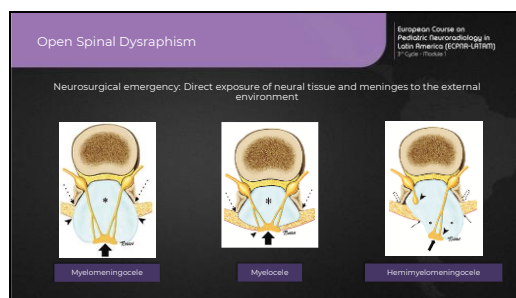
Table 1. Recommended MRI imaging sequences and parameters for the assessment of children with suspected MS/CD.

Sequence	Plane	Imaging Parameters	Notes
Clinical history			
T1-weighted T1 axial spine	Axial, sagittal, coronal	Slice thickness: 2/3, 4/5, 6/7, 8/9, 10/11, 12/13, 14/15, 16/17, 18/19, 20/21, 22/23, 24/25, 26/27, 28/29, 30/31, 32/33, 34/35, 36/37, 38/39, 40/41, 42/43, 44/45, 46/47, 48/49, 50/51, 52/53, 54/55, 56/57, 58/59, 60/61, 62/63, 64/65, 66/67, 68/69, 70/71, 72/73, 74/75, 76/77, 78/79, 80/81, 82/83, 84/85, 86/87, 88/89, 90/91, 92/93, 94/95, 96/97, 98/99, 100/101, 102/103, 104/105, 106/107, 108/109, 110/111, 112/113, 114/115, 116/117, 118/119, 120/121, 122/123, 124/125, 126/127, 128/129, 130/131, 132/133, 134/135, 136/137, 138/139, 140/141, 142/143, 144/145, 146/147, 148/149, 150/151, 152/153, 154/155, 156/157, 158/159, 160/161, 162/163, 164/165, 166/167, 168/169, 170/171, 172/173, 174/175, 176/177, 178/179, 180/181, 182/183, 184/185, 186/187, 188/189, 190/191, 192/193, 194/195, 196/197, 198/199, 200/201, 202/203, 204/205, 206/207, 208/209, 210/211, 212/213, 214/215, 216/217, 218/219, 220/221, 222/223, 224/225, 226/227, 228/229, 230/231, 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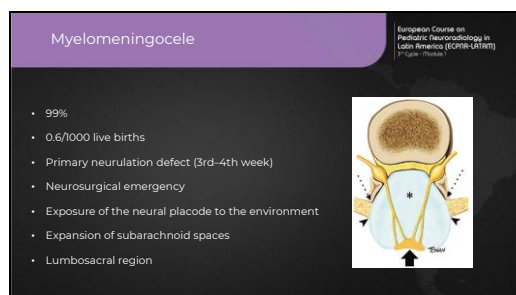
Slide 13



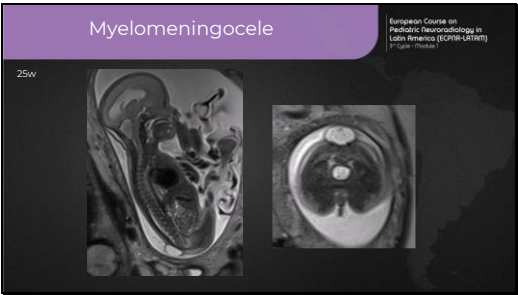
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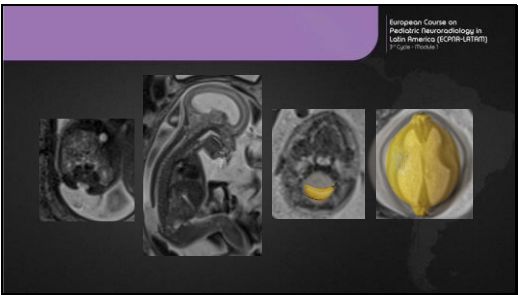
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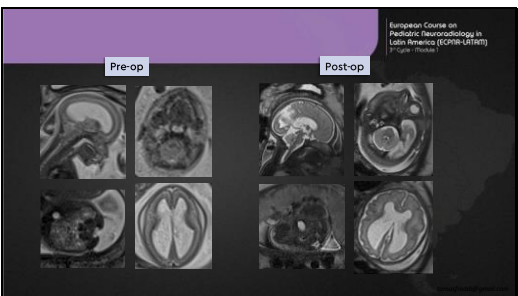
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Slide 17



Slide 18



Slide 19

European Course on
Pediatric Neuroradiology in
Latin America (ECPNR-LATAM)
17th Update - Brasília

Myelomeningocele

18w

Radiological report:

- Posterior fossa
- Ventricular dilation
- Extent of bone defect
- Other malformations
- Scoliosis/kyphosis
- Bone deformities

N Engl J Med. 2011 Mar 17;364(11):1095-1004. [PMID: 21345678]

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European Course on
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Latin America (ECPNR-LATAM)
17th Update - Brasília

Open x Closed

Chiari II

Chiari II

DLM

Acta Ann J Spontgenol. 2016 Dec;20(16):1316-1323

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17th Update - Brasília

Closed Spinal Dysraphism

Neural and meningeal tissues are covered by skin or subcutaneous tissue. There is no placode exposure.

With or without subcutaneous mass

With Subcutaneous Mass	Without Subcutaneous Mass	
Spina bifida occulta Spina bifida meningocele Myelomeningocele Meningocele	SIMPLE DYSRAPHIC STATES High/Retrolistric Spinae Tight Alar Hinge Persistence of the terminal ventricle	COMPLEX DYSRAPHIC STATES Sacral Atrial Cyst Sacrocaudal Dysgenesis Caudal regression syndrome Limited dorsal myelination

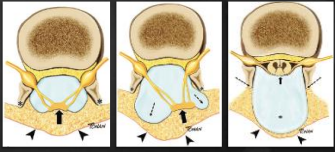
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Closed Spinal Dysraphism

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With subcutaneous mass

- Lipomyelomeningocele
- Lipomyelocele
- Lipomyeloschisis
- Meningocele
- Myelocystocele




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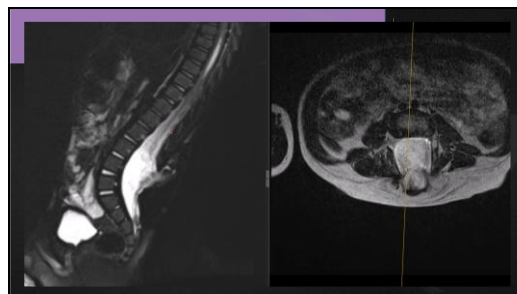
Lipomyelomeningocele

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Subcutaneous lipoma + meningocele
Primary neurulation defect (3rd-4th week)
Mesenchymal tissue insinuation into the neural tube
Placode/lipoma interface OUTSIDE the vertebral canal
Expansion of the subarachnoid space
Lumbosacral region



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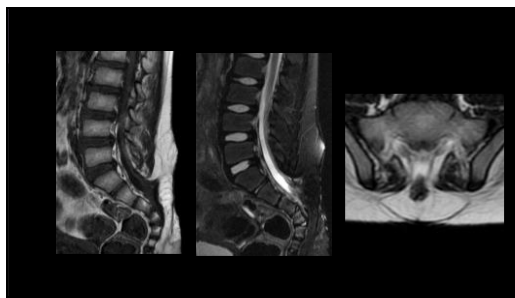
Lipomyelocele

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P. Gupta - Mumbai

Subcutaneous lipoma + "placode at bone level"
Primary neurulation defect (3rd-4th week)
Mesenchymal tissue insinuation into the neural tube
Placode/lipoma interface at the vertebral defect level (spina bifida)
WITHOUT expansion of the subarachnoid space
Lumbosacral region



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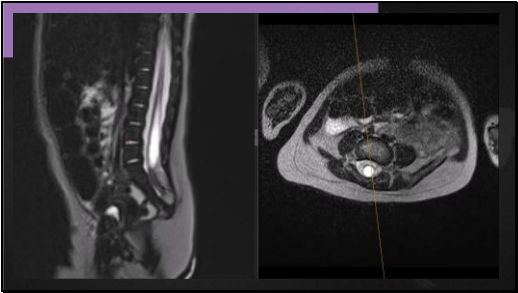
Lipomyeloschisis

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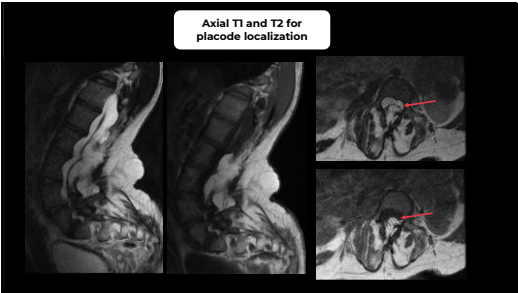
Subcutaneous lipoma + "placode inward"
Primary neurulation defect (3rd-4th week)
Mesenchymal tissue insinuation into the neural tube
Placode/lipoma interface inside the vertebral canal
WITHOUT expansion of the subarachnoid space
Lumbosacral region



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17/18 June - 19/20 June 2018

Without subcutaneous mass

Simple Dysraphic State	Complex Dysraphic State
Filar/Intradural Lipoma	Dermal Sinus
Terminal Ventricle	Diastematomyelia
Tethered Filum Terminale	Caudal Regression Syndrome
	Limited Dorsal Myeloschisis

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Filar/Intradural Lipoma

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Primary neurulation defect (3rd–4th week)
Lipomatous lesion within the spinal canal
May be associated with a low-lying conus

Tethered Cord Syndrome:
Clinical Diagnosis

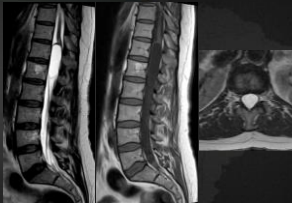


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Persistent Terminal Ventricle

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"fifth" ventricle
Secondary neurulation defect
Incidental finding (most cases)
CSF-signal cyst
Located in the conus medullaris



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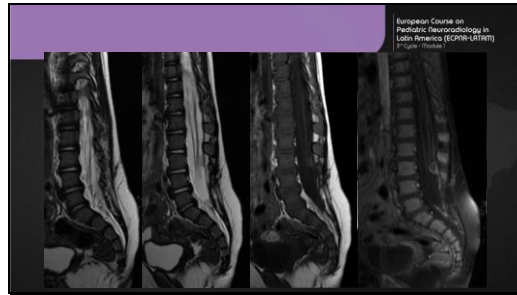
Dermal Sinus

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P. Liguori, M.D.

Primary neurulation defect (3rd–4th week)
Midline fistula lined by epithelium
Connects dural sac to the skin
Lumbosacral region
Cutaneous ostium
Recurrent meningitis
Hypointense line on T1 and T2



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Diastematomyelia

Gastrulation defect (2nd-3rd week)
Two hemicords, each with its own pia mater
Types 1 and 2
Lumbar region
Variable clinical presentation
Associated with bone malformations
May be associated with other dysraphisms

Type 1 Type 2

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Caudal Regression Sd

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Type 1

Type 2

Caudal agenesis
Gastrulation defect (2nd-3rd week)
1:3-10,000
Gestational diabetes
Types 1 and 2
Variable clinical presentation
Sacral dysgenesis

Abrupt and "high" termination of the conus
Wedge-shaped conus on axial plane
"Double band" sign of the nerve roots on axial plane

Low-lying conus
Associated with intraspinal "mass" (e.g., lipoma)

VACTEREL

What is VACTEREL?
VACTEREL is an acronym for the most common vertebral anomalies: Vertebral anomalies, Anorectal anomalies, Cervical anomalies, Tracheo-oesophageal anomalies, Renal anomalies, and Limb anomalies.
What is the prevalence of VACTEREL?
The prevalence of VACTEREL is approximately 1 in 10,000 live births.
What are the clinical features of VACTEREL?
The clinical features of VACTEREL are: Vertebral anomalies, Anorectal anomalies, Cervical anomalies, Tracheo-oesophageal anomalies, Renal anomalies, and Limb anomalies.
What is the pathogenesis of VACTEREL?
The pathogenesis of VACTEREL is multifactorial, involving both genetic and environmental factors.
What is the management of VACTEREL?
The management of VACTEREL is multidisciplinary, involving pediatric surgeons, neurologists, and other specialists.
What is the prognosis of VACTEREL?
The prognosis of VACTEREL is variable, depending on the severity of the anomalies.

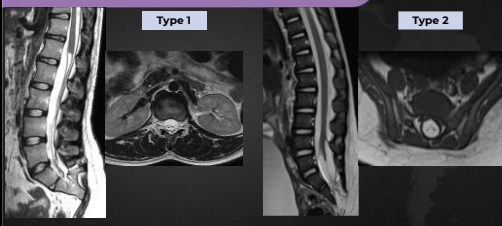
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Caudal Regression Sd

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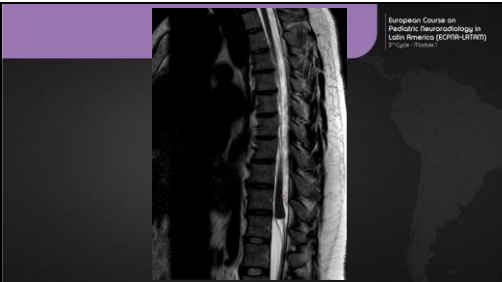
Type 1

Type 2



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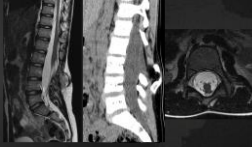


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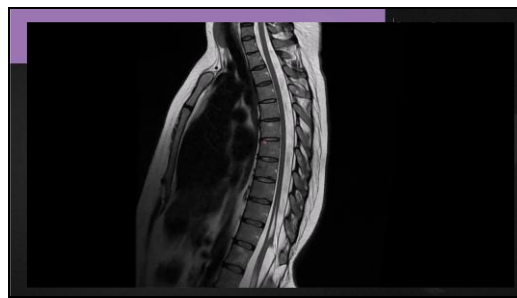
Limited Dorsal Myeloschisis

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Dr. Cyril H. Hooley

Primary or secondary neurulation defect
Uncommon
Variable clinical presentation
Fibro-neural tissue on the dorsal surface of
the spinal cord connecting to the dural
surface
Trapezoid-shaped conus on axial plane
Associated with cutaneous marker
Lumbosacral region



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Postoperative Evaluation

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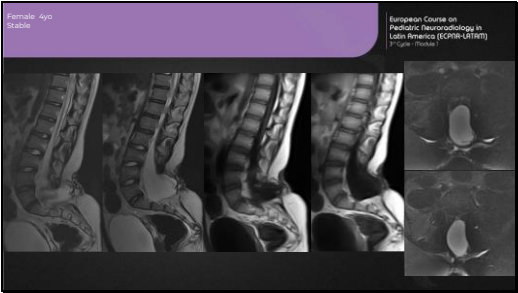
Complications near the surgical site

- Collections/infections
- Ectodermal inclusion cysts
- Fistula

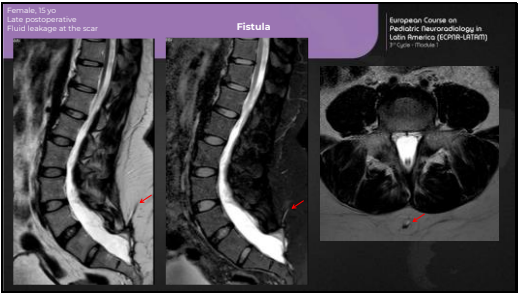
Spinal cord-related complications

- Hydrosyringomyelia
- Adherent cord

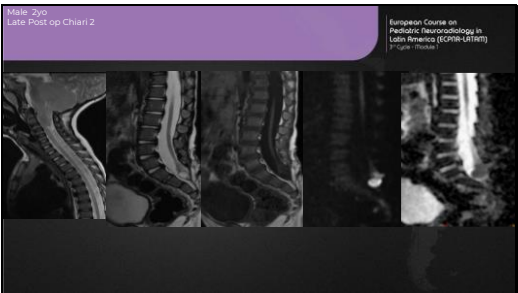
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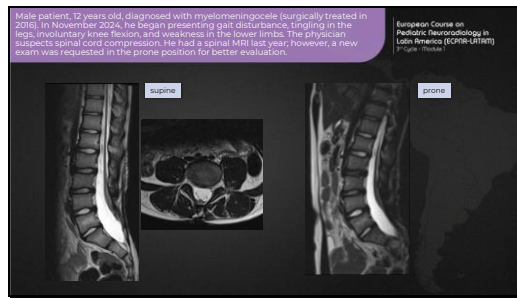
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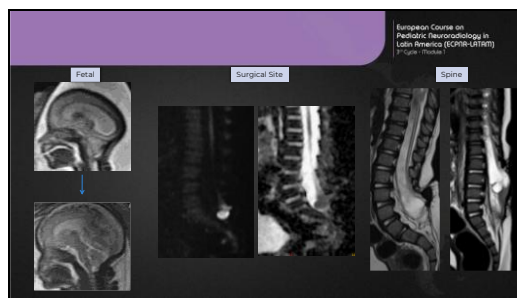
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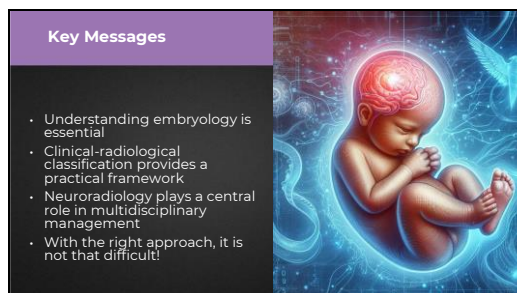
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Key Messages

- Understanding embryology is essential
- Clinical-radiological classification provides a practical framework
- Neuroradiology plays a central role in multidisciplinary management
- With the right approach, it is not that difficult.







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3rd Cycle - Module 1

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Identificazione:    Organizzazione: 