

SPONDYLOLISTHESIS AND SPONDYLOLYSIS

Herbiniaux[1782] described obstetric problem caused by spondylolisthesis

Kilian [1854] coined the term spondylolisthesis

Definition

Spondylolysis is defect in the pars inter-articularis whereas as spondylolisthesis is a forward displacement of the proximal vertebra with vertebral column above over the distal vertebra

Classification

I (Newman, Wiltse, McNab)

I Dysplastic		20%
II Isthmic	A. Lysis of Pars (Fatigue #)	45%
	B. Attenuation of Pars	
	C. Acute # (Acute Pars #)	Rare
III Degenerative		20%
IV Traumatic (Vertebral #'s other than Pars)		
V Pathological (Neoplastic or metabolic, Paget's , OI)		
VI Post-surgical		

II Marchetti and Bartolozzi

Type	Form	condition
Developmental	High Dysplastic	Pars lysis Pars elongation
	Low Dysplastic	Pars lysis Pars elongation
Acquired	Traumatic	Acute fracture Stress fracture
	Surgical	
	Pathological	Local pathology Systemic Pathology
	Degenerative	Primary ,Secondary

III Hermon's classification

Dysplastic
Developmental
Fracture: Acute
 Chronic: Stress reaction
 Stress fracture
 Pseudarthrosis
Pathological

Stress reaction



Stress fracture



Pseudarthrosis



Etiology

1. Congenital: rare. No evidence of lytic defect in the newborn
2. More in athlete: Mechanical stress can cause acute or stress fracture
3. Stress: During flexion and extension: compression and tensile force
4. Genetic : Autosomal dominant with incomplete penetration
5. Dysplastic : lack of lumbo-sacral facet joint may not withstand even normal daily activities

Incidence

Overall incidence: listhesis/Lysis:	16%
Female Gymnasts	10-20%
Alaskan population	50%
African	1.8%
Caucasian	5.6%

Natural History

1. Progression is rare in adults. Only in 5% progression of Spondylolysis to a low-grade listhesis. Progression to high-grade spondylolisthesis is rare.
2. Adults with Spondylolysis have no more back pain than the rest [10%]
3. Dysplastic type have frequent neurology and progression of deformity.
4. Athletes Vs normal. 8% incidence of asymptomatic spondylolysis and spondylolisthesis reported in the general population as opposed to 40% of athletic participants.

Dysplastic Type I

L5-S1 common site

Male: Female 1:2

Pathology: Spina bifida, Elongation of pars, Rounded sacrum, trapezoid vertebra, Hamstring tightness (High grade slip)

Isthmic Type II

Male: Female 2:1.

Familial

Common in Athletes, gymnasts, fast bowlers, Scheurman's 50% in Eskimos (Genetic)

Site: Level: L5 (87%); L4 (10%) and L3 (3%)

Neurological symptoms or hamstring spasm is not seen

Clinical

Children: 3 presentation

I. Mild-moderate slip

Low back ache with stiffness

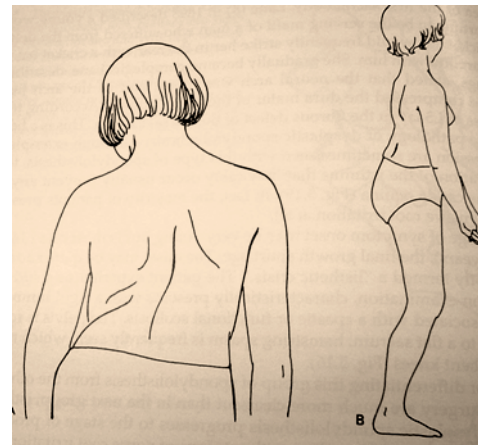
II. High grade slip

Back ache +/- radicular pain

Bizarre posture and gait problems

III. Severe slip

Like II with or without cauda equina lesion



Adults

Long standing backache (common)

High slip

Crab like gait [flexion at Hip and knee, broad base]

Buttocks become flattened; Step

Paraspinal spasm

Hamstring spasm

Torso is foreshortened

Lumbo-sacral Kyphosis and hyperlordosis, Scoliosis

Neurological assessment



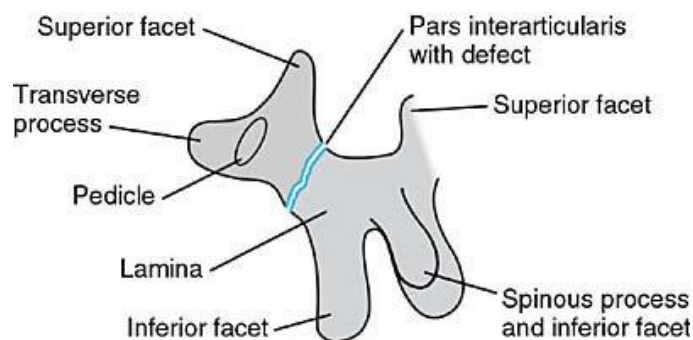
X ray

Standing: AP, Lateral, Oblique

Dysplastic or Isthmic depending on shape of the sacrum or vertebra

In spondylolysis in oblique view

Scottish terrier: with the defect in the dog's neck



SCOTTY DOG

- Listhesis: 1. Grade [Meyerding]
 2. Slip angle
 3. Sacral inclination
 4. Lordosis

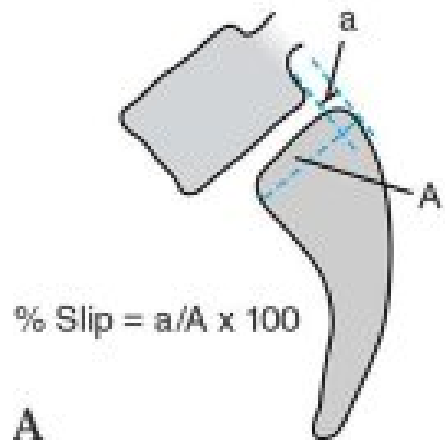
Listhesis

I Amount of displacement

Meyerding grading

- I 0-25%
- II 25-50%
- III 50-75%
- IV >75%

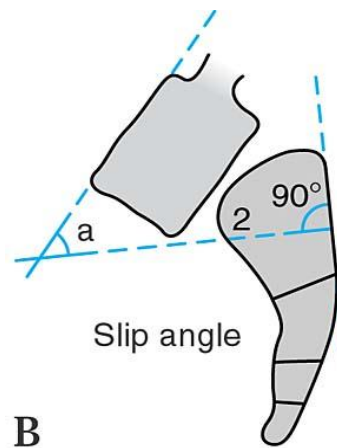
> 50% means a high grade



II Slip angle: N: 0 to -10°

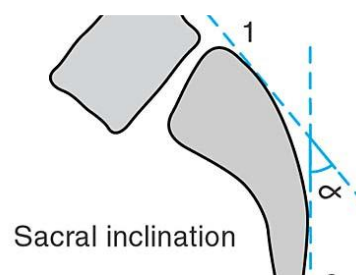
>10° means high grade

Superior border may be difficult to define and therefore perpendicular is drawn from the posterior aspect of S1 to the anterior lip

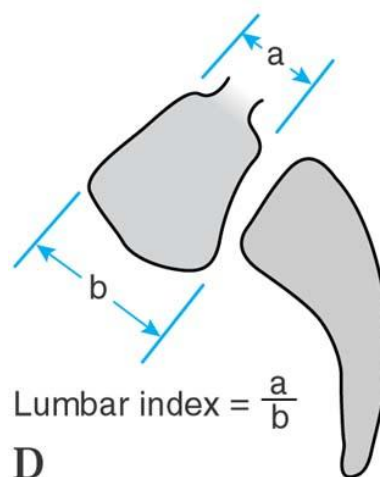


III Angle of sacral inclination

Measured from the vertical axis and the posterior cortex of the sacrum



IV Lumbar index



V Angle of Lumbar lordosis

L1 to L5 (superior surface)

SPECT

SPECT scan is negative in isthmic, genetic and healed stress fracture

Positive in stress reaction or fracture

Negative SPECT with pars defect means spondylolysis is not the source of pain

CT

Thin-cut axial CT of the lumbosacral spine using the reverse gantry

Localized sclerosis without trabecular disruption is a stress reaction.

With a break in pars interarticularis is a Stress fracture

CT also is useful to assess the morphology of vertebra and canal

MRI

Is indicated when neurologic symptoms

Risk factors for slip progression

young age at presentation

Treatment

I Low grade slip and all asymptomatic patients when slip is < 50% does not require any treatment.

II When symptomatic

Reduce sports and activity modification

Exercises: Flexion strengthening exercise

Stop smoking

X-rays every 6 months until maturity

Role of brace

Not beneficial unless one hip is included

Athlete

Once asymptomatic, can return to sports and there is no need to curtail their activity

If Pain returns: then consider surgery.

High grade slip

Usually requires stabilization

Acute fracture

Always need surgery

Chronic fracture

Always hot

CT scan at 6 months after non-op

Go back to sports

If symptomatic: Repair

Operative

Indications

1. Always indicated when slip is over 50% or slip angle $>10^\circ$ as in dysplastic
2. Failed Non-operative treatment in Lysis or Grade I and II listhesis
3. Significant neurological deficit

Options

1. Operative repair
2. Only decompression (Gills Procedure)
3. In situ, Intertransverse fusion
4. Decompression and Intertransverse fusion
5. Instrumentation and fusion
6. Reduction and Instrumentation fusion with or without Anterior or posterior interbody fusion

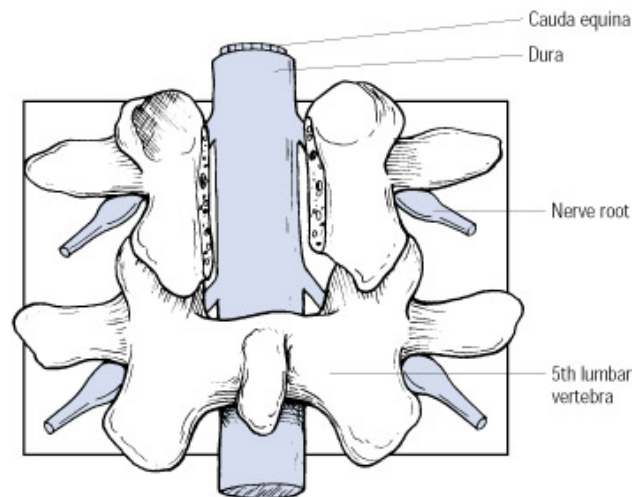
Gills laminectomy

Technique

Laminectomy and excise fibrocartilage at pars interarticularis

30% instability [displacement] at 5 yrs

60% good to excellent results.



Repair Pars Interarticularis

Indicated: Spondylolysis or grade I listhesis in young adolescent

Advantages: Preserves motion segment

Types

Scott and Nicol

Tension band wiring around the transverse process and Spinous process.

Reported 92% success

Scott's



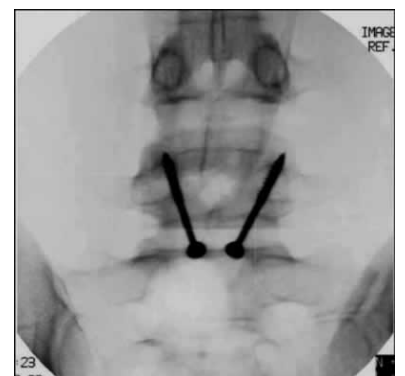
Buck's

Bucks

Screw fixation from inferior facet to the pedicle

Bone graft the defect.

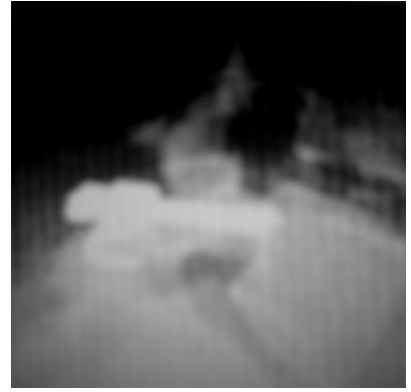
Reported 95% healing



Morscher:

Sublaminar Hook and screw

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Hodgson

Pedicle screw and wire



Surgical treatment of spondylolisthesis

1. Level of Fusion

Grade I & II slip L5-S1 Posterolateral fusion
Grade III, IV, V L4-S1 Posterolateral fusion

2. Type of fusion

Posterolateral fusion is common
Posterior interbody fusion
Anterior interbody fusion

3. Instrumentation

In Children –Posterolateral fusion and Pantaloon type cast x 3 months
In adults Posterolateral fusion and pedicle fixation



4. Decompression

When neurology is present
When reduction is planned in spondylolisthesis when slip is over 50%

Spondyloptosis

1. Leave it alone
2. Reduction: High incidence of neurology
3. Resection of L5 with reduction of L4 on to the sacrum

Weinstein: Results of high grade slips treated with and without fusion. Their conclusion is at an 18 yr follow up, there was little difference between the results of operative and nonoperative treatment.

Recently in some spinal centres, there is a trend to use of open technique to reduce high grade slip as it improves cosmesis, restores of trunk height, improves buttock and spine contour and decompresses nerve root.

