

# A Structural Service Plan: Towards Better and Safer Spine Surgeries

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# Introduction



2000年一月二十一日 星期日 第XXXX號 農曆庚辰年十二月二十七日

市民對廉潔合法化意見

鼓勵廉潔風氣更盛  
以本會建議，所以能對社會  
有公認，因為認錯只會對社會  
廉潔風氣更盛。

通訊人士 謝先生



# 下半生輪椅度過 責屯門醫院疏忽 頸手術變廢 少婦索償

根

【本報訊】一名少婦因頸椎手術疏忽，導致下半生坐輪椅，頸部手術變廢，她向屯門醫院索償。據悉，該名少婦在屯門醫院接受頸椎手術後，因醫院疏忽，導致手術失敗，頸椎受損，下半生只能坐輪椅度日。她目前正在法律程序上爭取賠償。

## 醫生沒解釋清楚

在九六年，一名少婦在屯門醫院接受頸椎手術。手術後，她發現頸部疼痛，行動不便。她向醫院查詢，但醫生沒有給出合理的解釋。她感到非常失望和憤怒，最終決定向醫院索償。

## 為兒子誓與病魔搏鬥

初出院常與天吵架  
六年來，一名少婦為了兒子的健康，與病魔進行了艱苦的搏鬥。她的兒子患有嚴重的疾病，她不惜一切代價，尋求各種治療方法。在兒子手術後，她發現兒子的病情並沒有好轉，她感到非常絕望。她決定與病魔搏鬥到底，直到兒子康復為止。



# Spine Surgery

- Narrow margin of error
- Outcomes
  - Difficult to predict
    - Pain Vs neurological deficit
- Complications
  - Potential devastating consequences
    - Patient
    - Family
    - Surgeon
    - Hospital
    - Hospital Authority
    - Community



# Spine Surgery Complications

- Complication  $\neq$  poor surgical outcome
- Avoiding complication = decrease the chance of potential devastating sequel



# Spine Surgery Complications

- Zero complication is un-realistic!
- Some complications are avoidable!
  - Disease factor
  - Patient factor
  - Surgeon factor



# A Structural Service Plan was developed for Spine Surgery

Aiming at:

Provide quality care to patients

Decrease surgery related complications





To have a Standard as  
Reference



Develop a Structured  
Service Plan



Implementation +  
Continuous Audit



No standard / reference  
could be found!

No study / literature either locally or overseas  
to compare with



We have to create our  
own reference

Retrospective  
Data Collection



- From 1<sup>st</sup> Jan 1999 till 31<sup>st</sup> Dec 2004
- All bony surgeries of the spine column under general anaesthesia (simple implant removal excluded)
- Operation records, inpatient and outpatient records retrieved from Clinical Management System (CMS) and reviewed by a single assessor



- Operation count was based on the administration of general anaesthesia to one particular pathology in one anatomical region of the spine column



# The followings were defined as complications

- One month in-patient mortality
- Deep wound infection requiring surgical exploration
- Incidental durotomy
- Permanent neurological deficit



# Salvage operation

- Subsequent operations that are performed because of unsatisfactory results of the index surgeries
  - May or may not be avoidable



# The Study Period

All operation involving the bony spine column from 1<sup>st</sup> Jan 2005 till  
31<sup>st</sup> Dec 2007





# The Service Plan

- A. Pre-operative Phase
- B. Immediate post-operative phase
- C. Rehabilitation phase



# A. Pre-operative Phase

*A good rapport with adequate explanation and examination by a competent and experienced surgeon after peer review*



# A. Pre-operative Phase

1. *Designated Spine Surgeons*
2. *Operation Procedure Selection*
3. *Consent Procedure*
4. *Documentation*



## B. Immediate post-operative phase

- 1. Neurology monitoring*
- 2. Post-operation instructions*
- 3. Designated NS / APN*



# Neurology Monitoring

<b>HOSPITAL AUTHORITY</b> <b>NTWC TUEN MUN HOSPITAL</b> <b>Department of Orthopaedics &amp; Traumatology</b>  <b>Neurological Assessment Form</b>		Name: _____ Sex/Age: _____ ID. No.: _____ Ward/Bed: _____ HN: _____ Dept: _____ Admission date/Time: _____														
Surgical Procedure: _____		Operation Date: _____														
Frequency: _____																
<b>Motor(M) indicator-</b> 0 - complete paralysis 1 - flicker of contraction 2 - movement when gravity is excluded 3 - movement against gravity 4 - movement against gravity + resistance 5 - normal power																
Chart the relevant score of motor indicator in Left(L) and Right(R) column																
Level		<input type="checkbox"/> Cervical Level					<input type="checkbox"/> Lumbar Level					PU	Amount	Sign		
		C5	C6	C7	C8	T1	L2	L3	L4	L5	S1					
Date	Time	L	R	L	R	L	R	L	R	L	R	L	R			

Neurological Assessment Form Version 1 on 12-8-04





# Neurological Assessment



## Upper limb

- C4-Shoulder abduction
- C5-Elbow flexion
- C6-Wrist extension
- C7-Elbow extension
- C8-Fingers flexion
- T1-Fingers abduction

## Power

## Lower limb

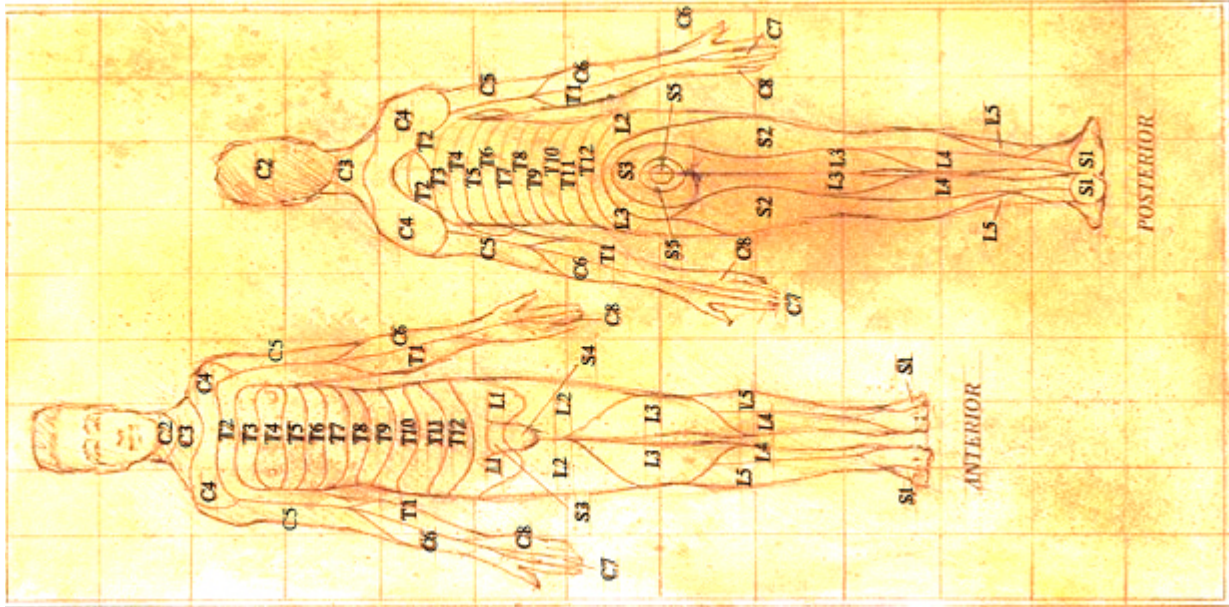
- L2-Hip flexion
- L3-Knee extension
- L4-Ankle dorsiflexion
- L5-Big toe extension
- S1-Big toe plantar flexion

## Grading

- 0-complete paralysis
- 1-flicker of contraction
- 2-movement as gravity excluded
- 3-movement against gravity
- 4-movement against resistance
- 5-normal power

# Neurological Assessment

## Sensation



## Grading

- 0-Absent
- 1-Impaired
- 2-Normal
- NT-Not Testable

# Post spine operation order

- **Diet**
- **Intravenous fluid**
- **Oxygen supplement**
- **Monitoring**
  - **BP / P Q H**
  - **SaO2 Q H**
    - Continuous oximeter monitoring needed / not needed\*
    - Inform if SaO2 < \_\_\_\_\_ %
  - **Urine output Q H**
  - **Sensory monitoring Q H**
  - **Motor monitoring Q H**
  - **Investigations**
    - » **X-ray**
    - » **Check blood**
      - o Hb
      - o Urgent Electrolyte
      - o ABG
  - **Transfusion instruction**
- **Patient positioning**
  - **Turning**
    - free / logroll\* Q H
  - **Prop up**
    - To \_\_\_\_\_ degrees / not allowed\*
  - **Pillow**
    - allowed / not allowed\*
    - Ordinary pillow / cervical pillow\*
- **Keep neck collar / lumbar corset**
- **Anti-thrombotic stockings**
- **Chart drain**
- **Analgesic**
- **Antibiotic**
- **Special Instructions**
- **In case of need please contact Dr.**
- Note: \* delete where appropriate



# ***Designated NS / APN***

- He / she will make sure the post-operative instructions have been carried out appropriately.





## C. Rehabilitation Phase

*How is the patient doing after operation with continuous peer review*



# C. Rehabilitation Phase

1. *Clinical aspect*
2. *Audit*



# *Clinical aspect*

- Direct telephone enquiry service provided by designated NS / APN to post-operative cases
- Follow-up in designated clinic for comprehensive care and rehabilitation
- Continuous documentation with various functional charts



# Functional Charts

- Cervical and thoracic spine
  - Japanese Orthopaedic Association (JOA) Score
  - Visual Analogue Scale (VAS)
- Lumbar spine
  - Japanese Orthopaedic Association (JOA) Score
  - Visual Analogue Scale (VAS)
  - Oswestry Disability Index (ODI)



# *Audit*

- Clinical outcomes and delayed onset complications will be kept under continuous surveillances.
- Spine surgery audit meetings will be held regularly.



# Results



- Reference

578 operations

– 537 patients

- 40 had 2 operations
- 1 had 3 operations

16 salvage operations  
(2.77%)

- Study

344 operations

– 329 patients

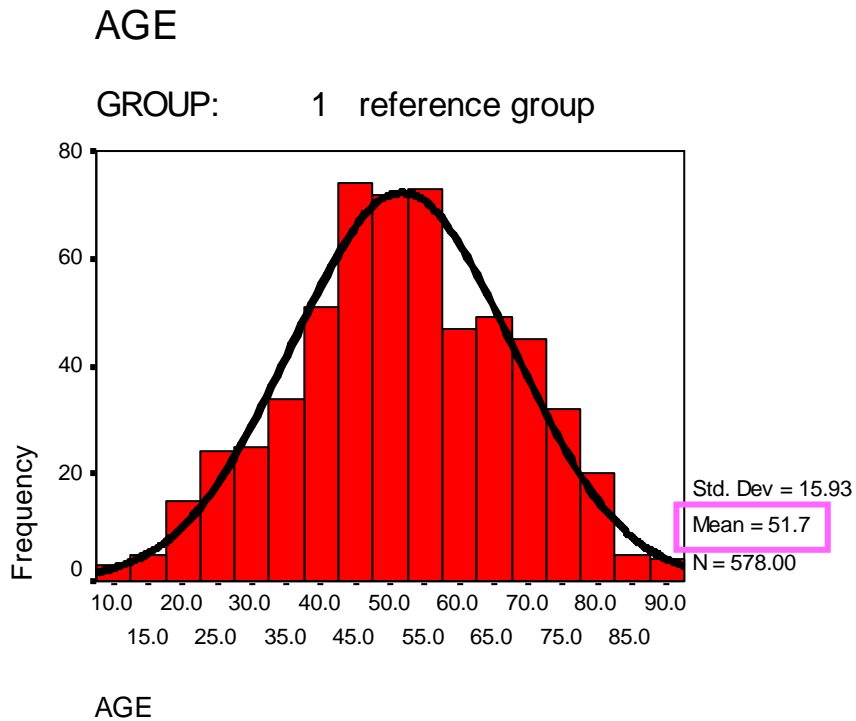
- 15 had 2 operations

5 salvage operations  
(1.45%)

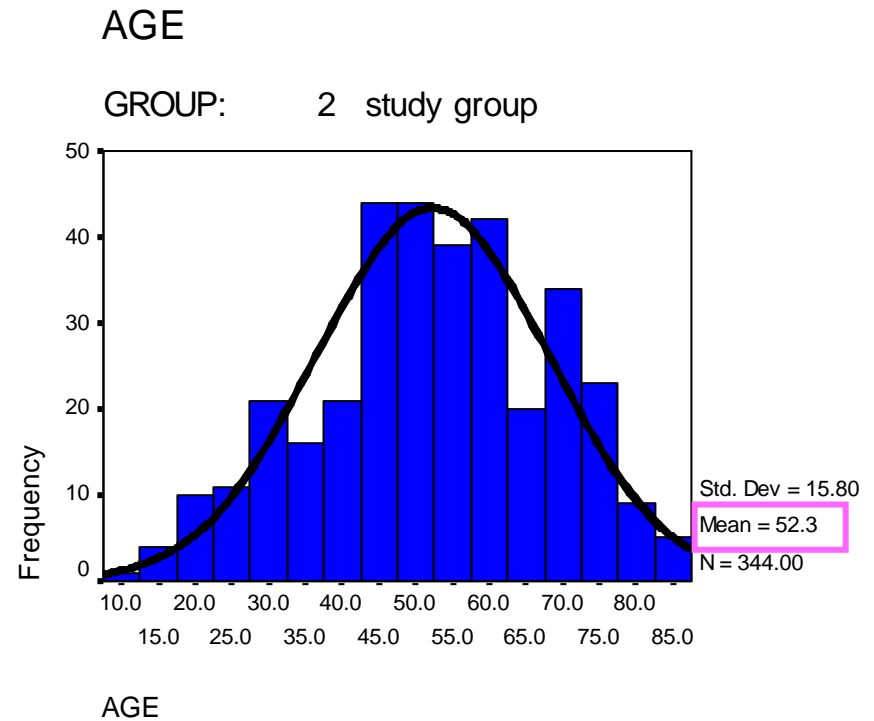


# Age distribution

- Reference

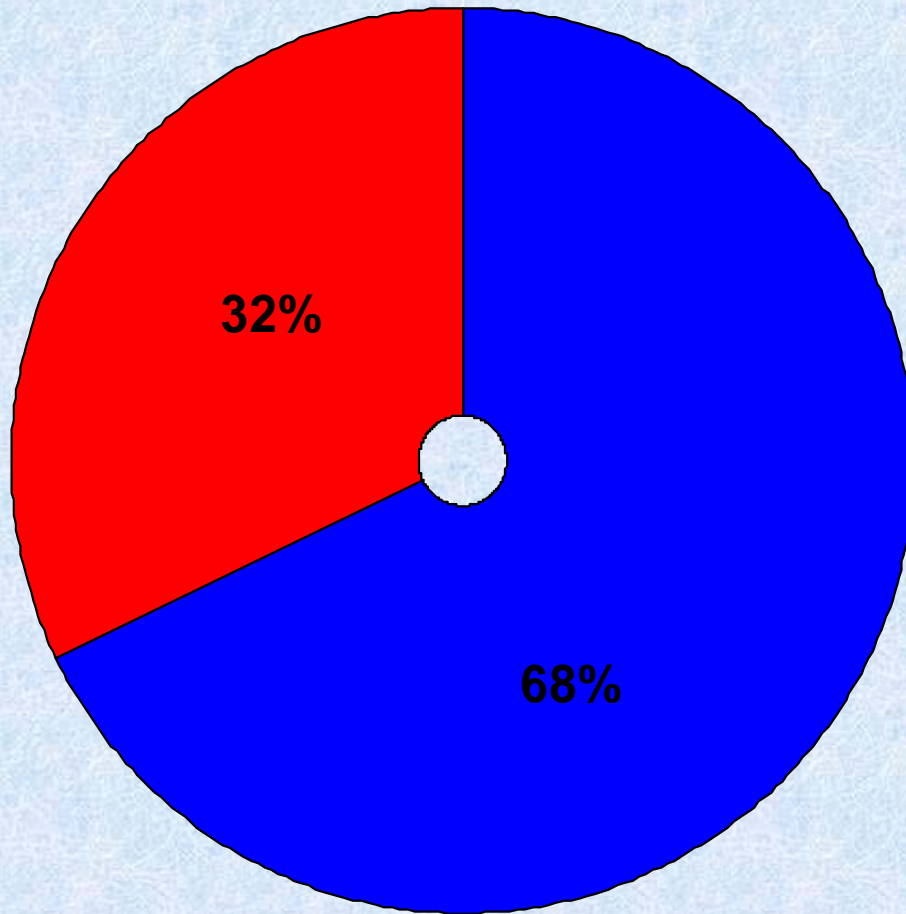


- Study





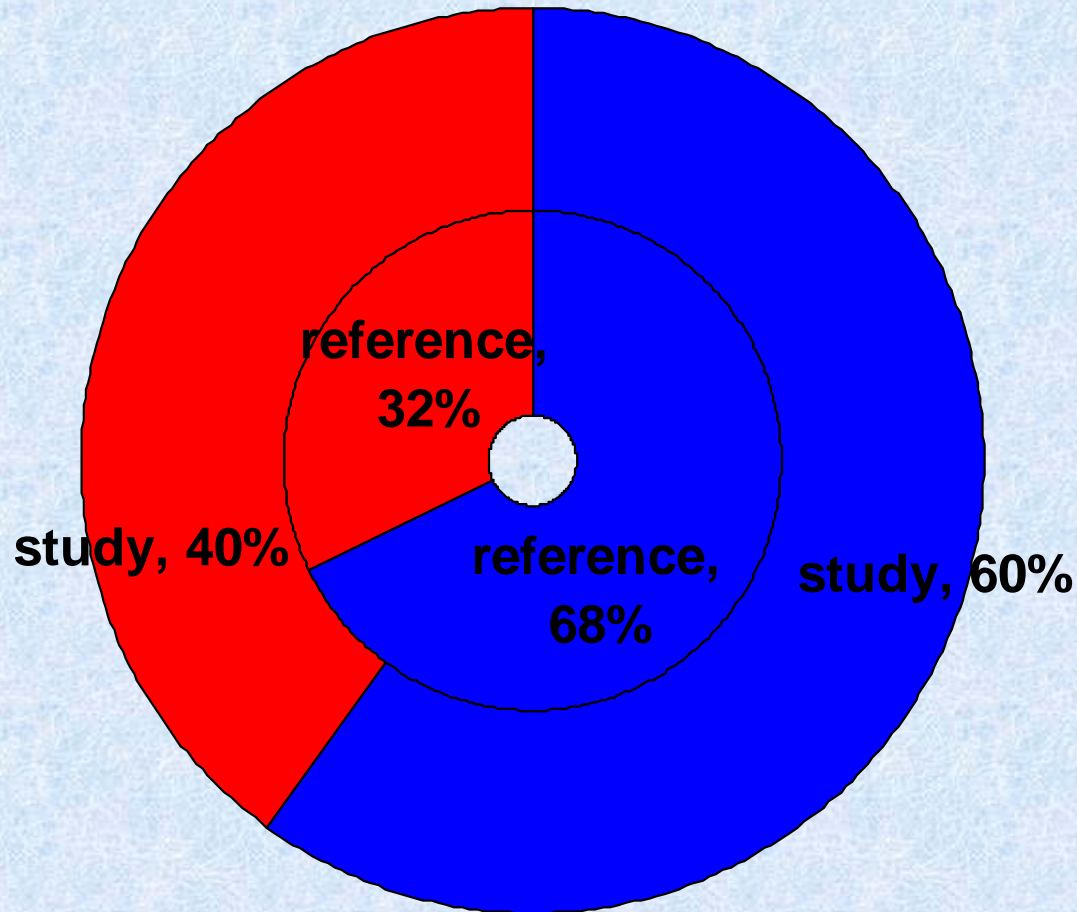
# Sex distribution (reference)



■ male  
■ female



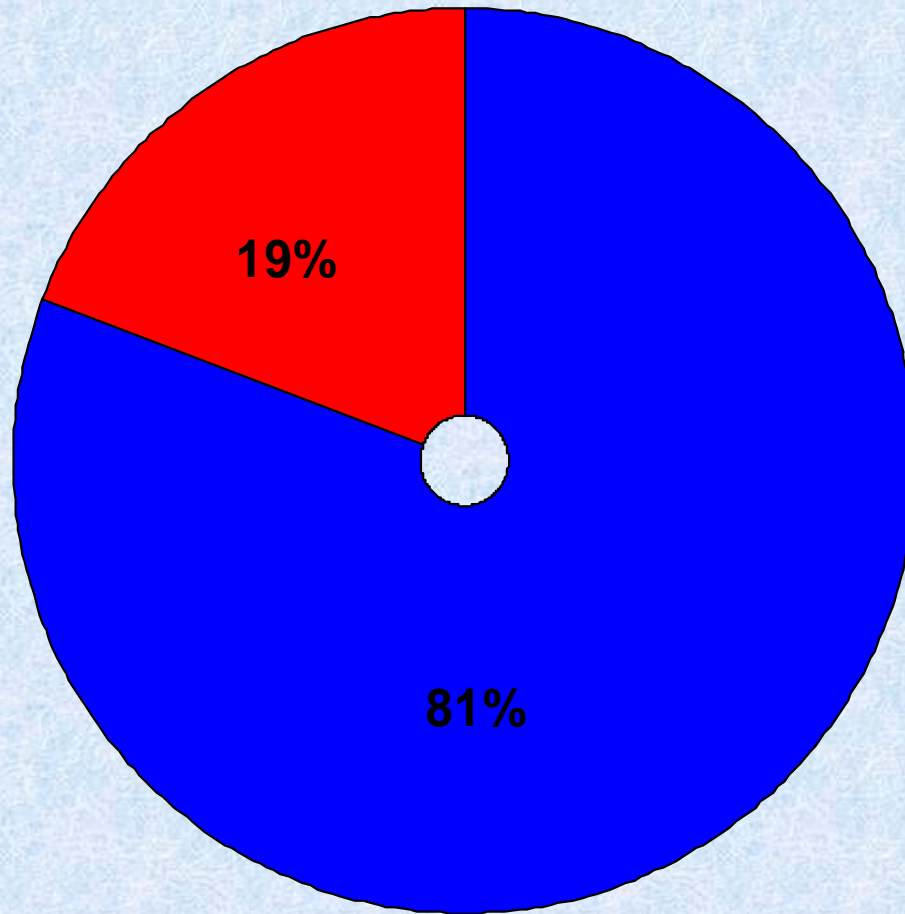
# Sex distribution (reference Vs study)



■ male  
■ female



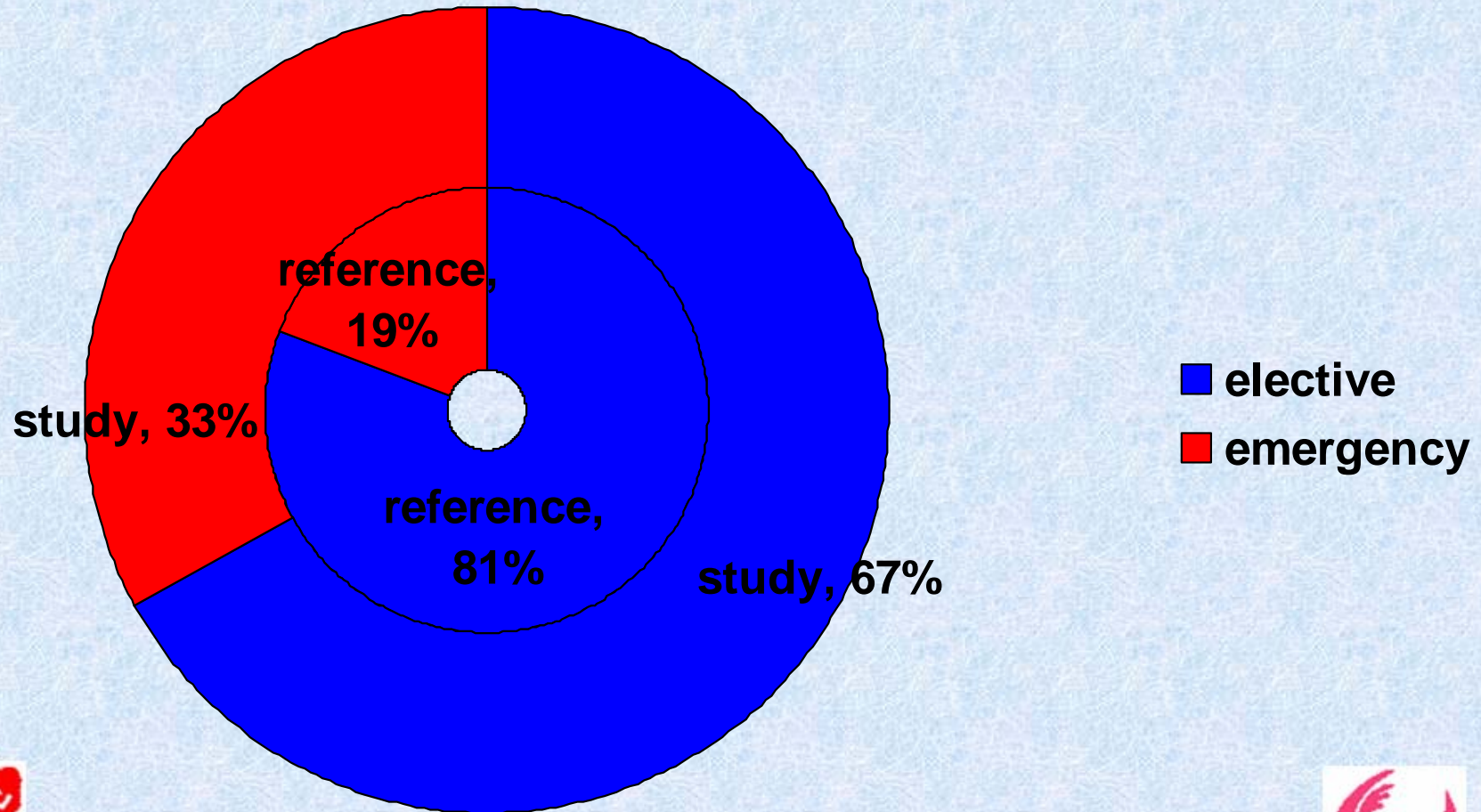
# Type of operation (elective Vs emergency) (reference)



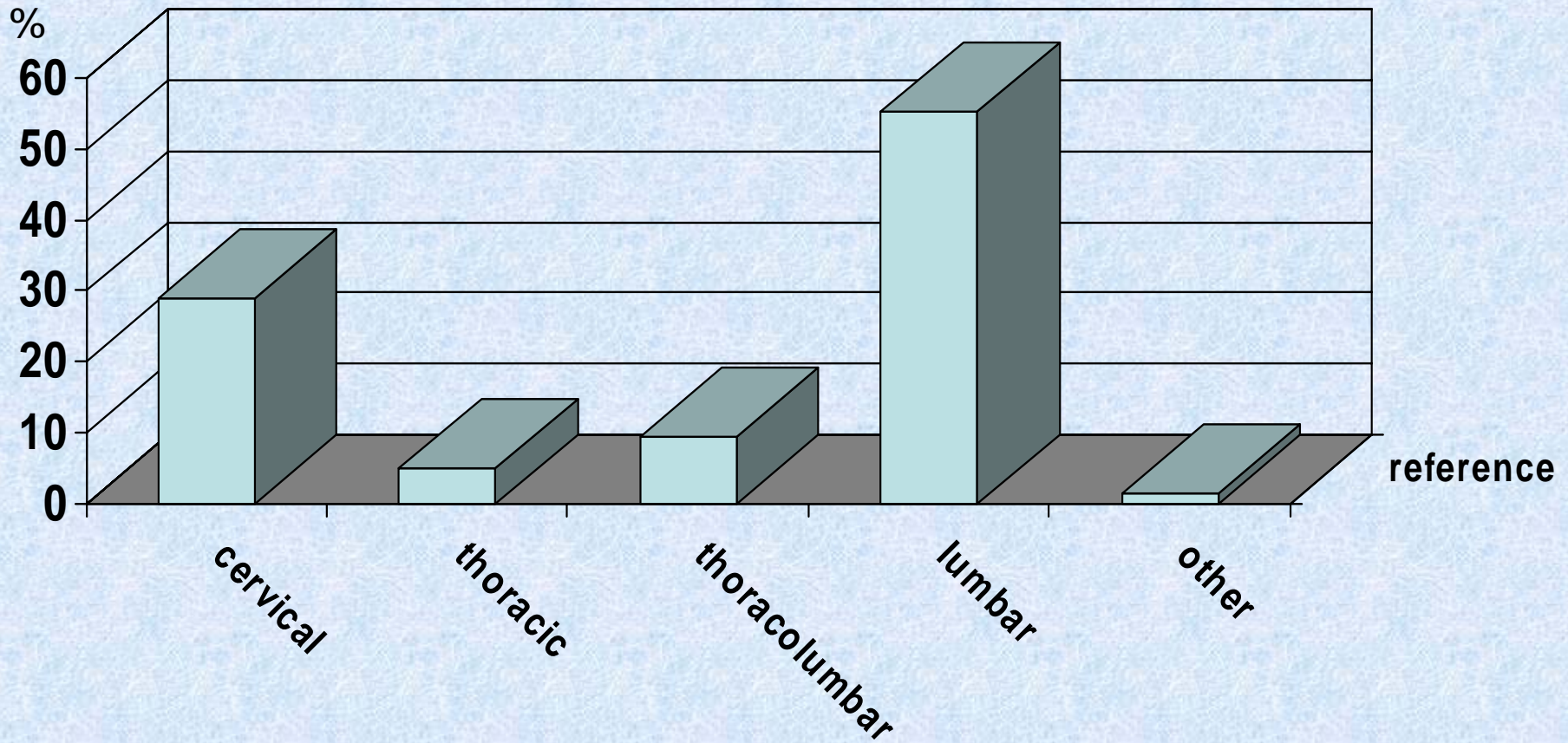
■ elective  
■ emergency



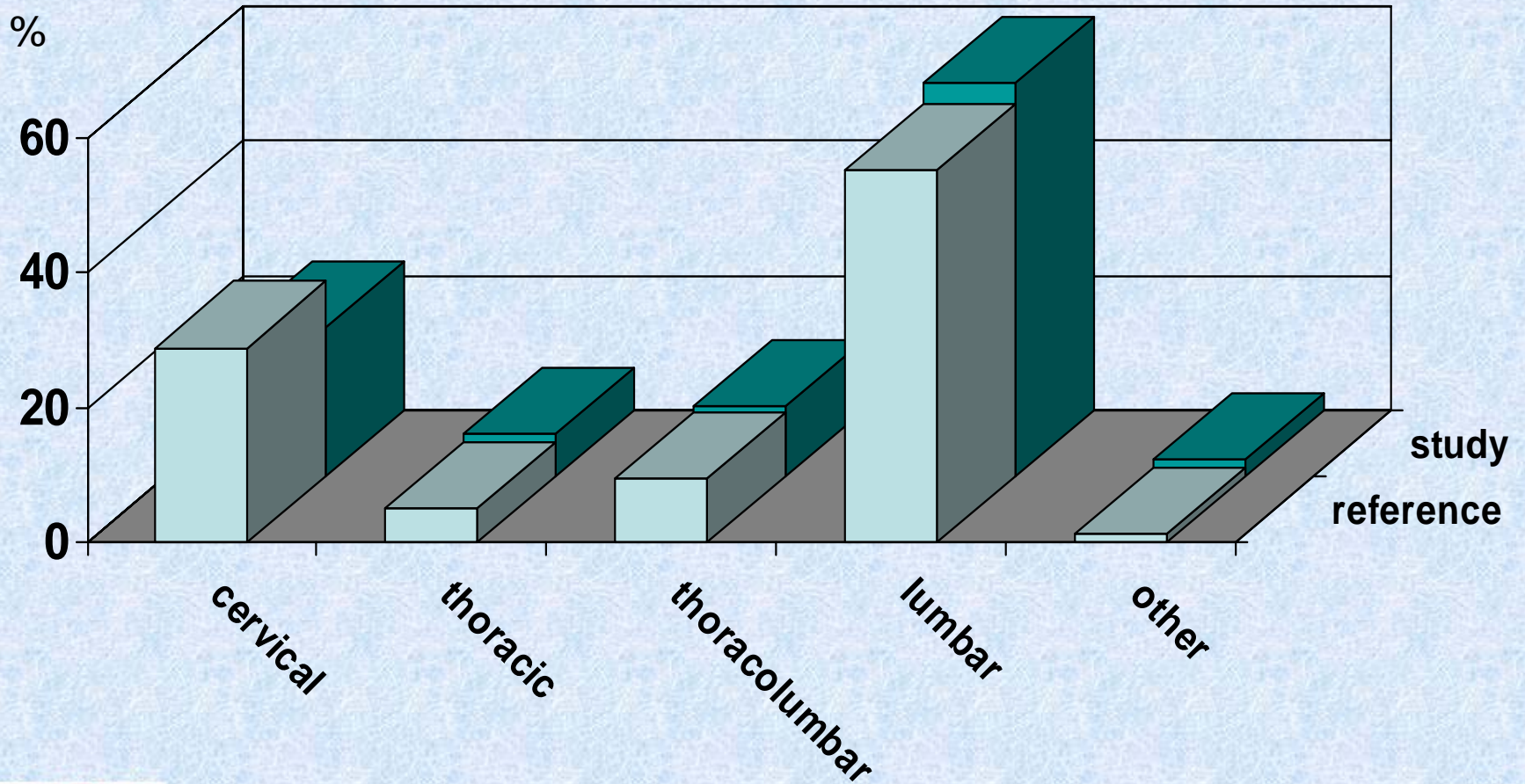
# Type of operation (elective Vs emergency) (reference Vs study)



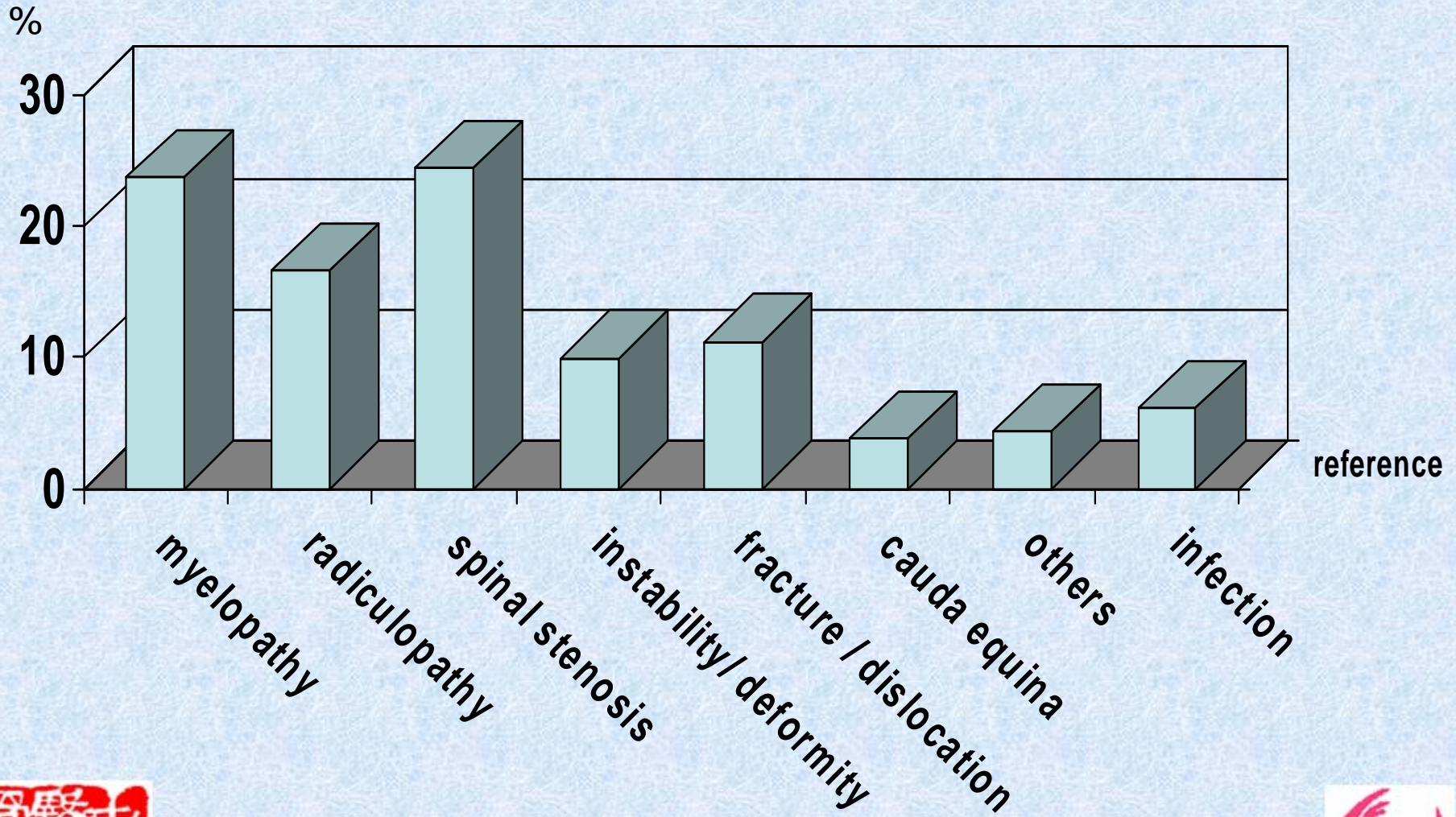
# Region of operation (reference)



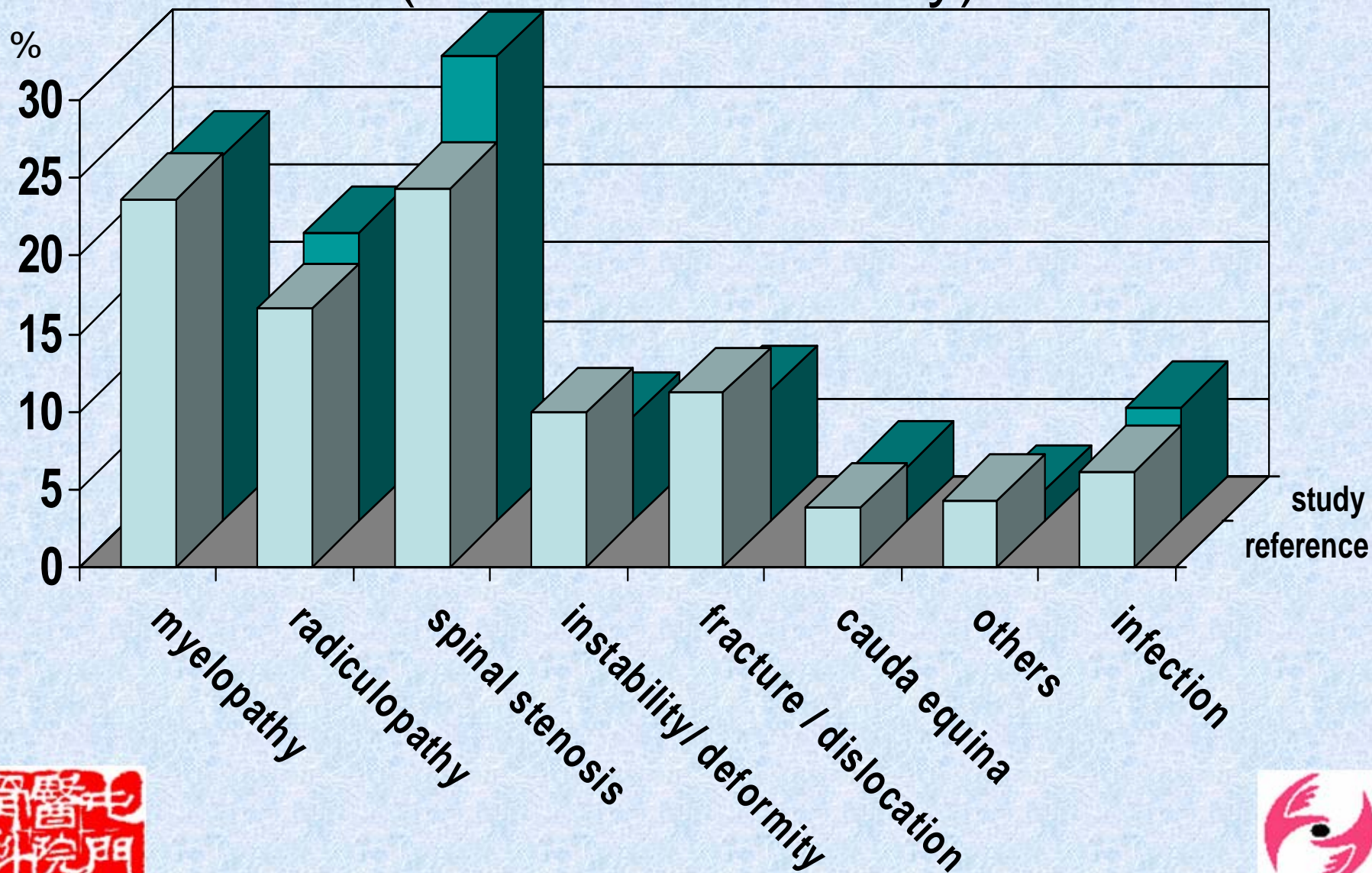
# Region of operation (reference Vs study)



# Diagnosis (reference)

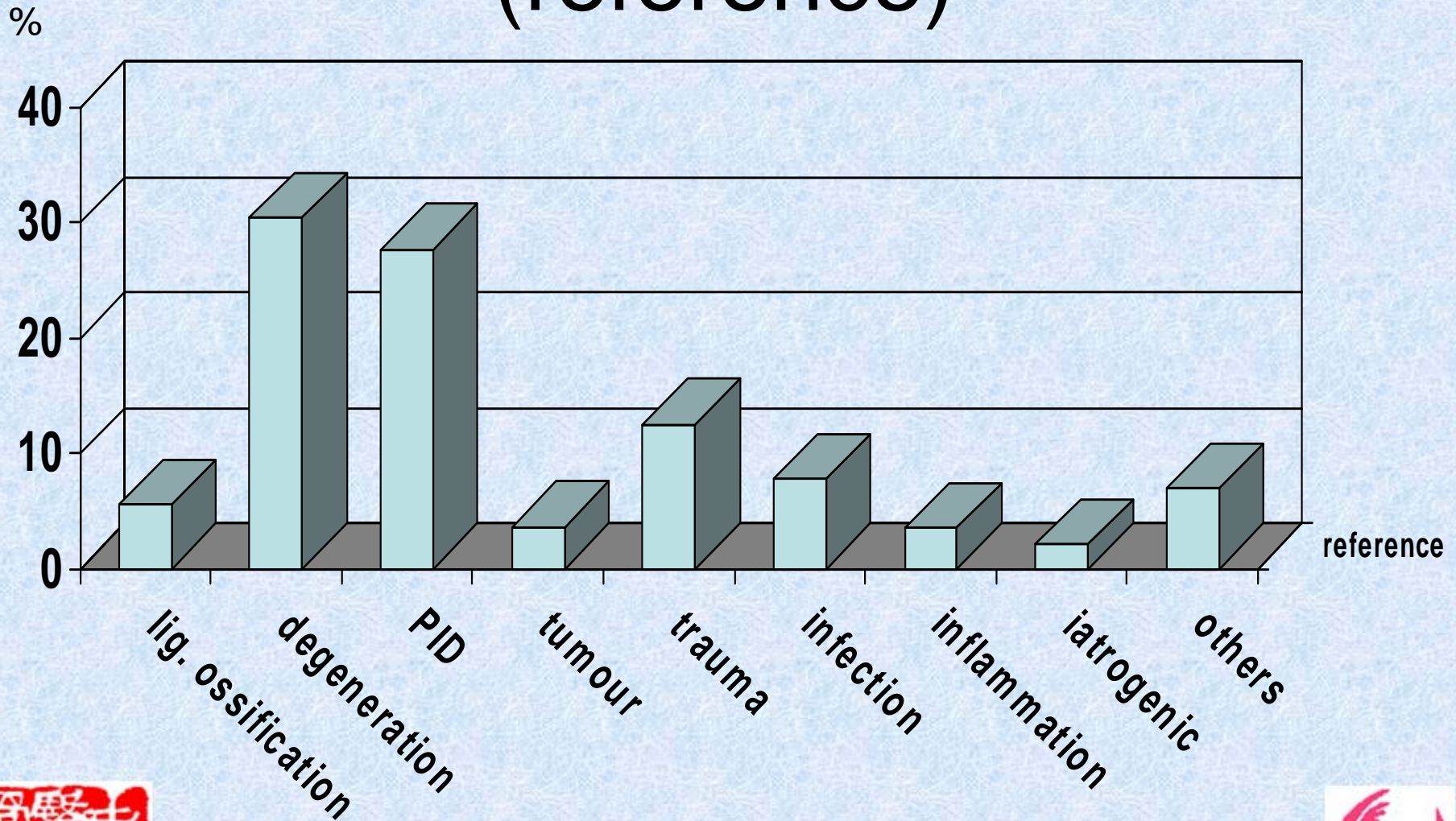


# Diagnosis (reference Vs study)

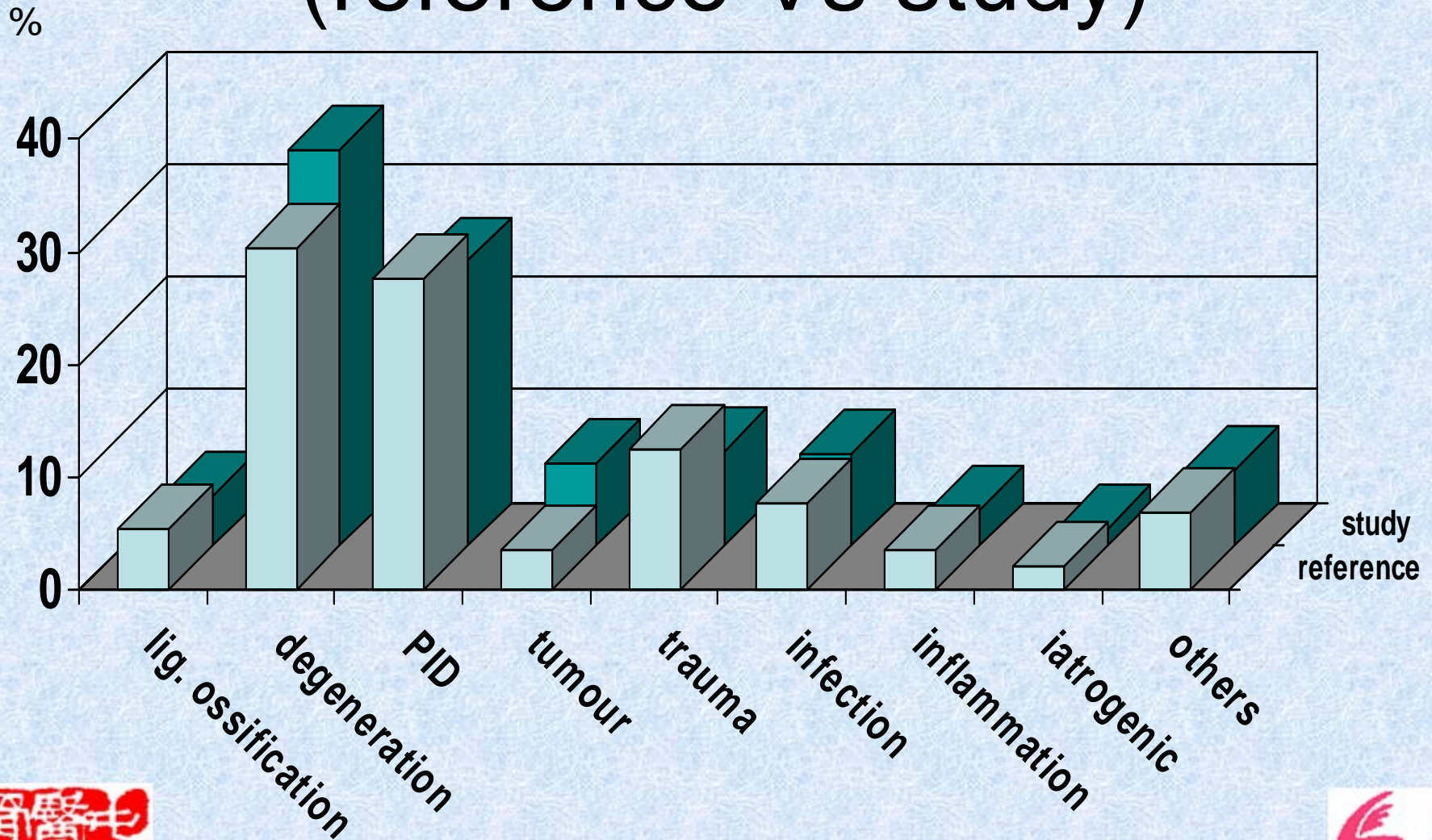




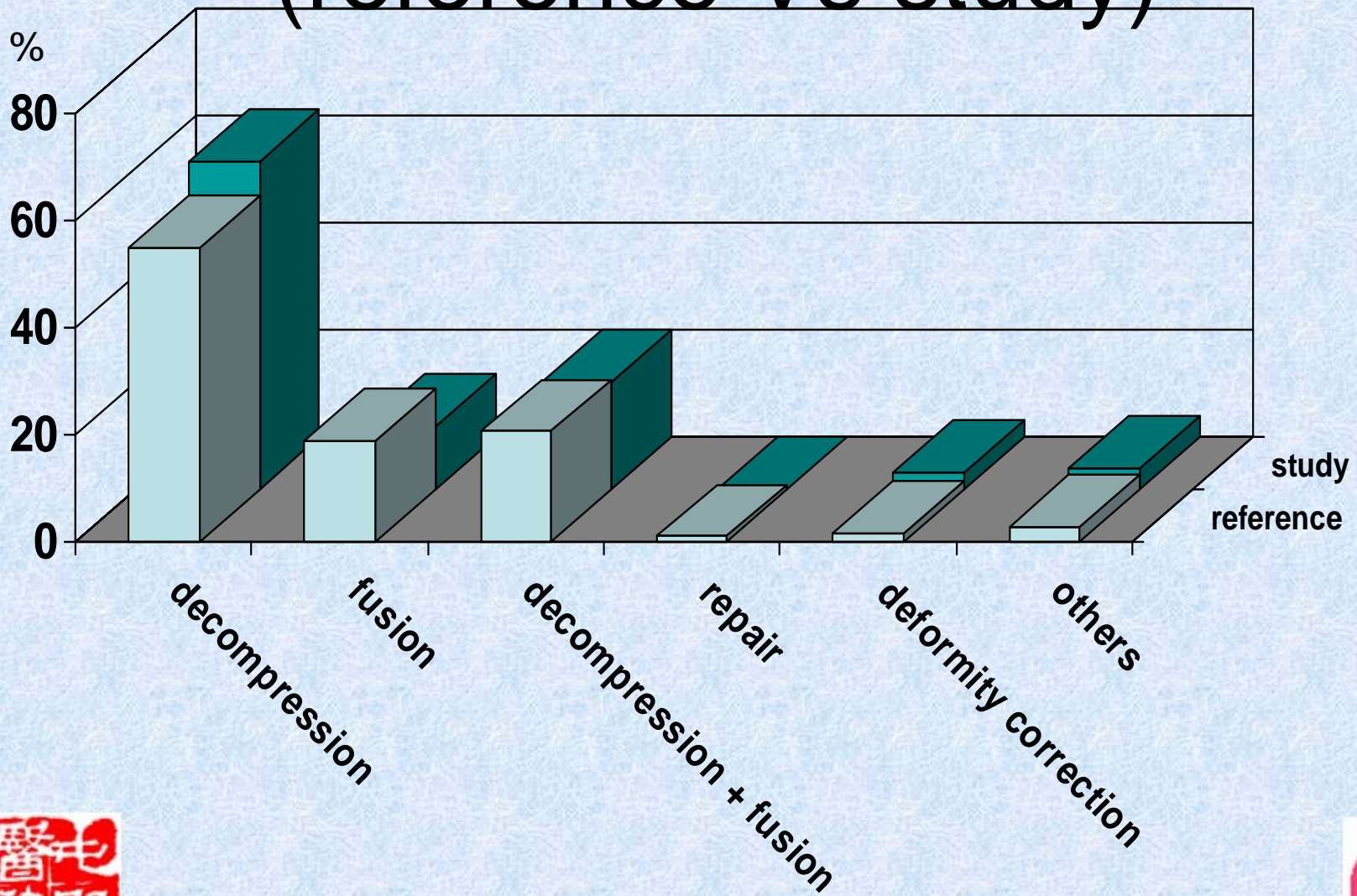
# Pathology (reference)



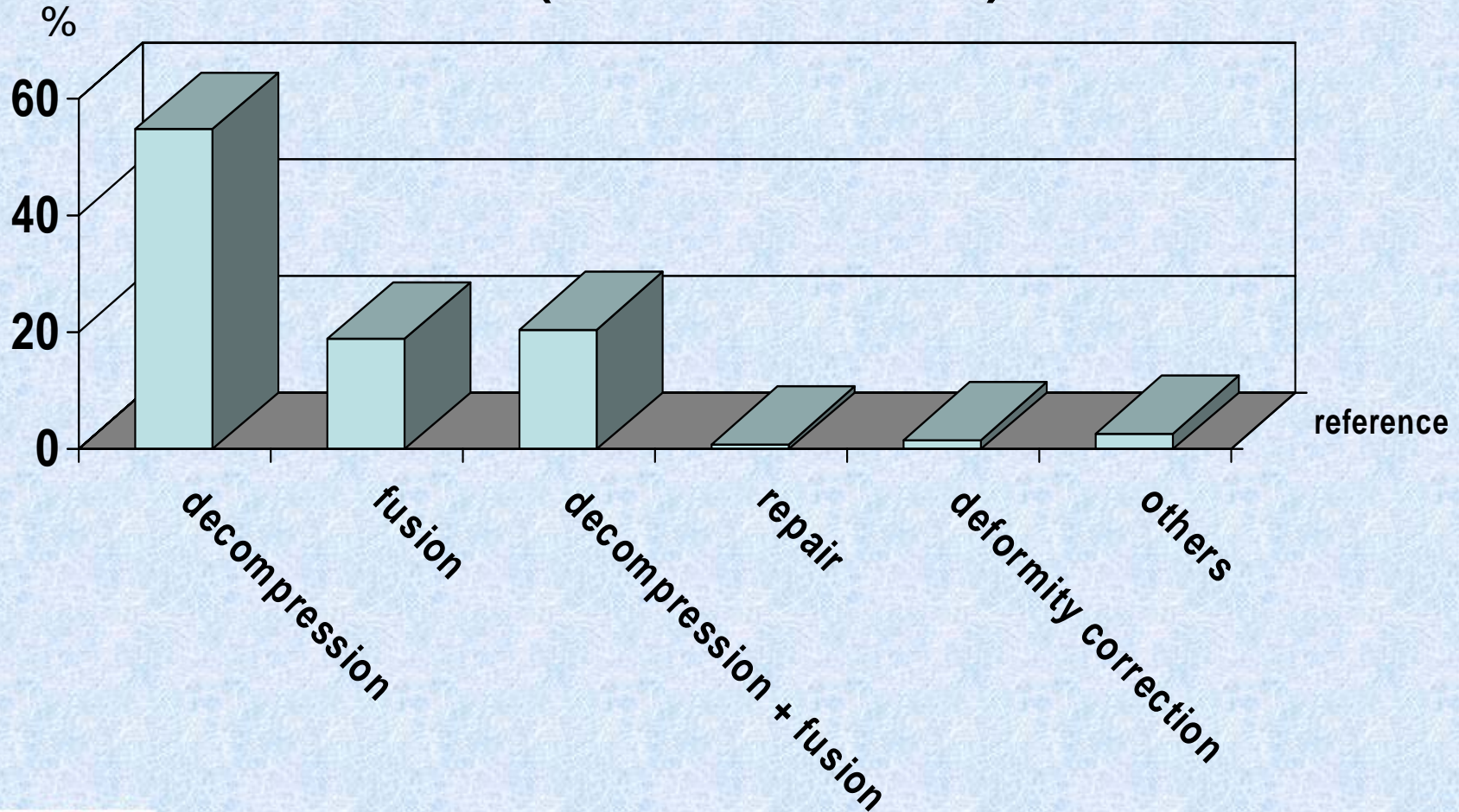
# Pathology (reference Vs study)



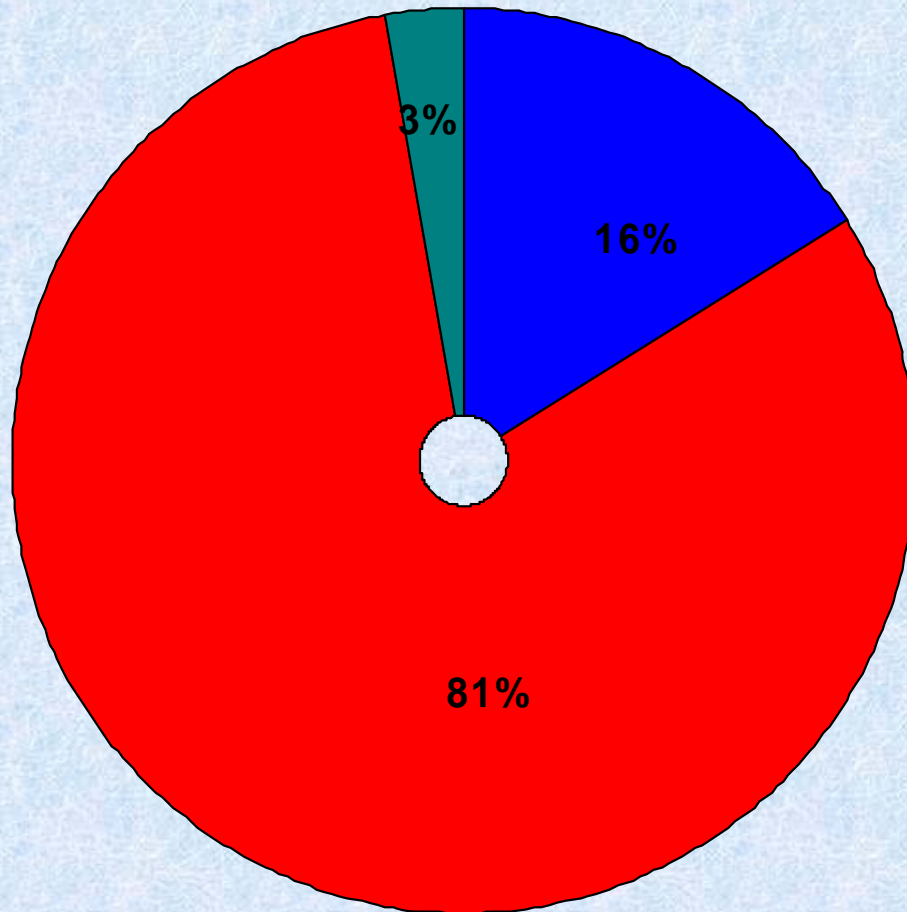
# Management (reference Vs study)



# Management (reference)



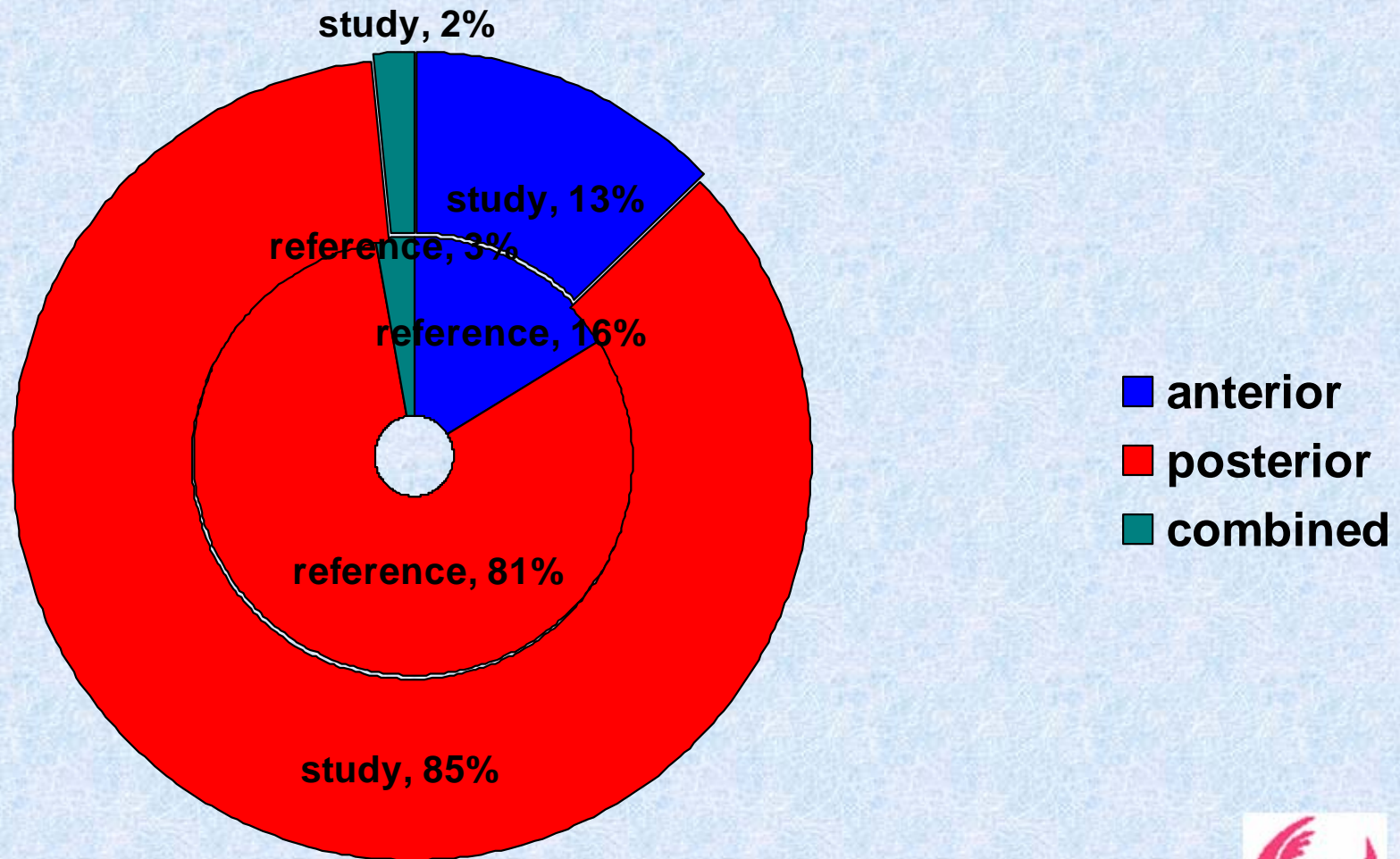
# Surgical approach (reference)



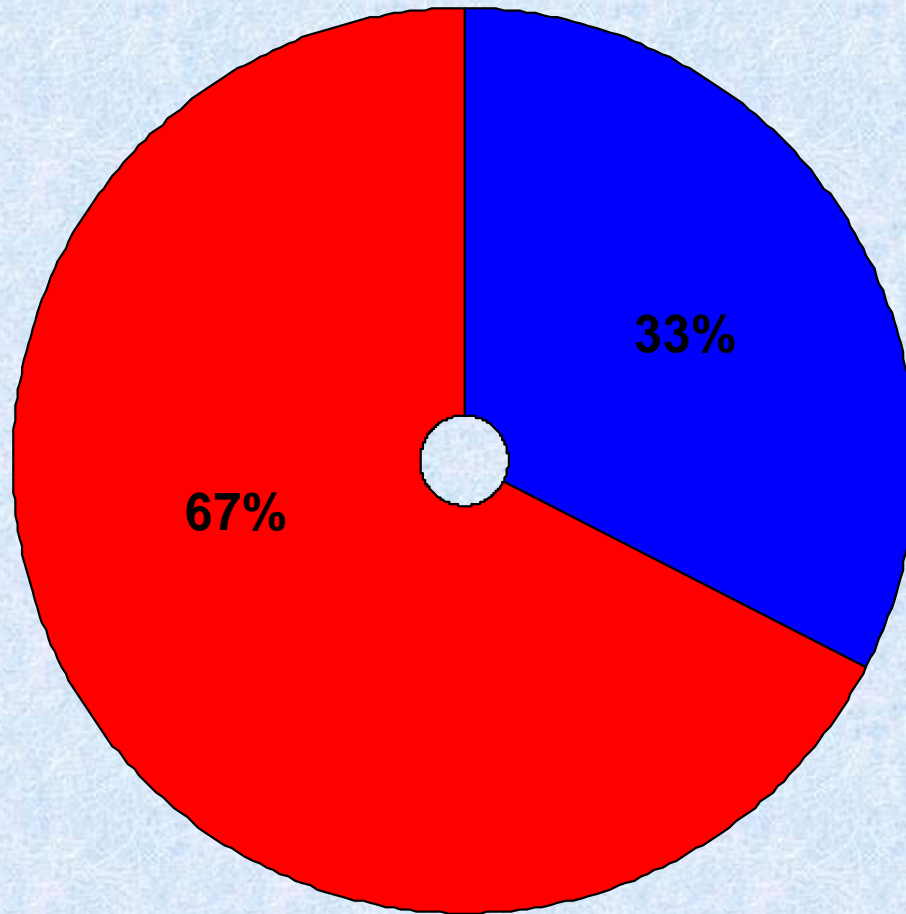
- anterior
- posterior
- combined



# Surgical approach (reference Vs study)



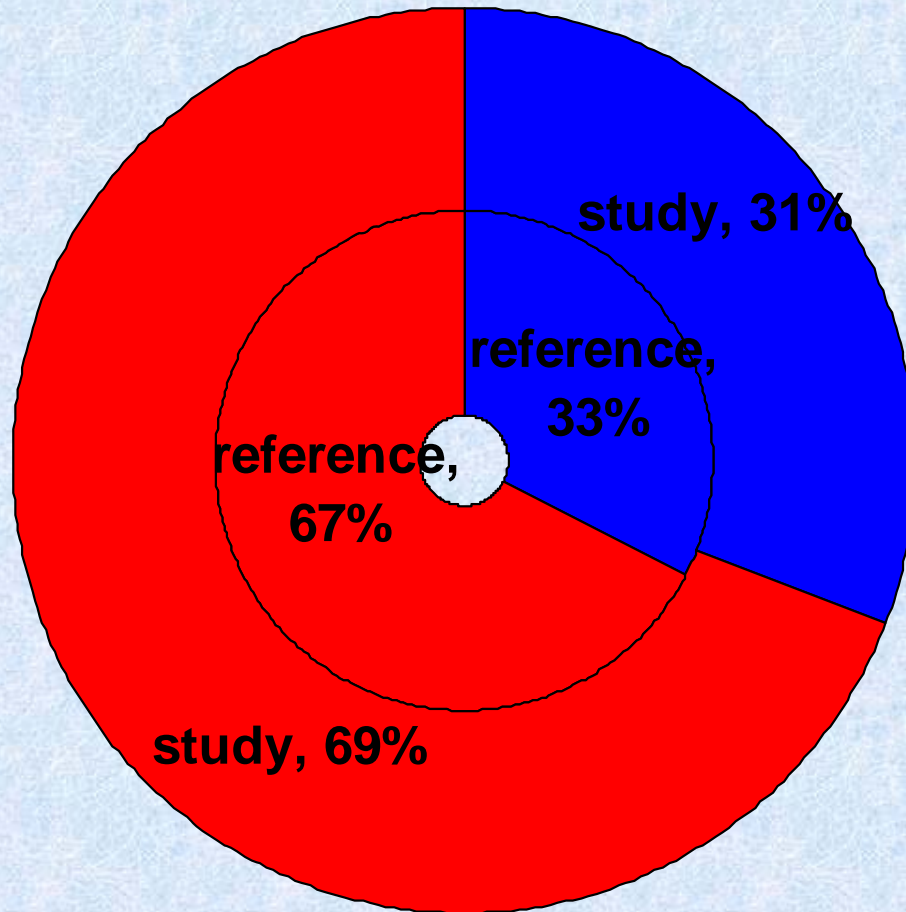
# Instrumentation (reference)



■ yes  
■ no



# Instrumentation reference Vs study)



■ yes  
■ no





# Complications



# One month in-patient mortality

- Reference
  - 3 in 537 patients (0.56%)
    - 2 oncological cases
    - 1 admitted with traumatic tetraplegia
- Study
  - 1 in 329 patients (0.3%)
    - Septic spondylitis



# Deep wound infection requiring surgical exploration

- Reference

- 17 cases in 578 operations  
(2.94%)

- Study

- 5 cases in 344 operations  
(1.45%)



# Incidental durotomy

- Reference
  - 27 cases in 578 operations  
(4.67%)
- Study
  - 19 cases in 344 operations  
(5.52%)



# Permanent neurological deficit

- Reference
  - 8 cases in 578 operations (1.38%)
    - 1 paraplegia
    - 5 cauda equina syndrome
    - 2 single leg weakness, need walking aids
- Study
  - 1 in 344 operations (0.29%)
    - Single leg weakness, walking aids not needed



# Specific diseases groups

- cervical myelopathy
- lumbar spinal canal stenosis
- lumbar radiculopathy

- Reference

- 324
- 56%

- Study group

- 210
- 61%

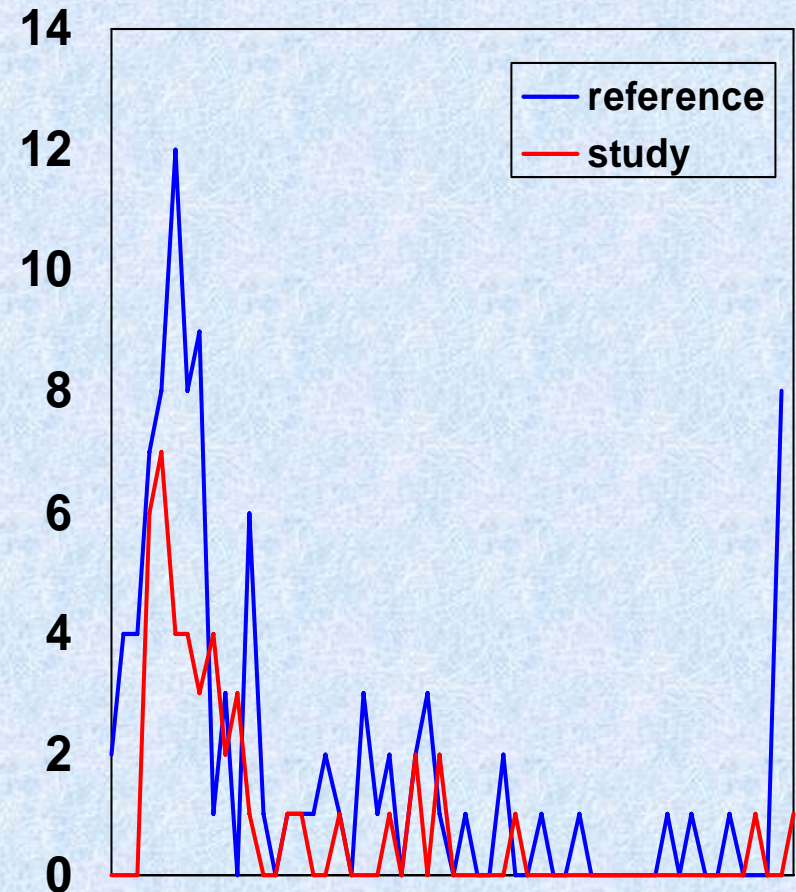


# Cervical myelopathy



# Post-surgery acute hospital stay

	Reference	Study group
Number of operation	103	54
Percentage of total operation	17.8	15.7
Mean (days)	24.3	15.2
Median (days)	9	9
Mode (days)	7	5





# Clinical Improvement

- Before operation
  - VAS
    - 4.2
  - JOA score
    - 10
- At last follow-up
  - VAS
    - 2.4
  - JOA score
    - 13.5

Average follow-up duration:  
10.8 months



# JOA score improvement ratio

- Improvement ratio of Hirabayashi

$$\left[ \frac{(\text{post-OT score}) - (\text{pre-OT score})}{17 - (\text{pre-OT score})} \right] \times 100\%$$

$$\left[ \frac{( 13.5 ) - ( 10.0 )}{17 - ( 10.0 )} \right] \times 100\%$$

$$= 50 \%$$

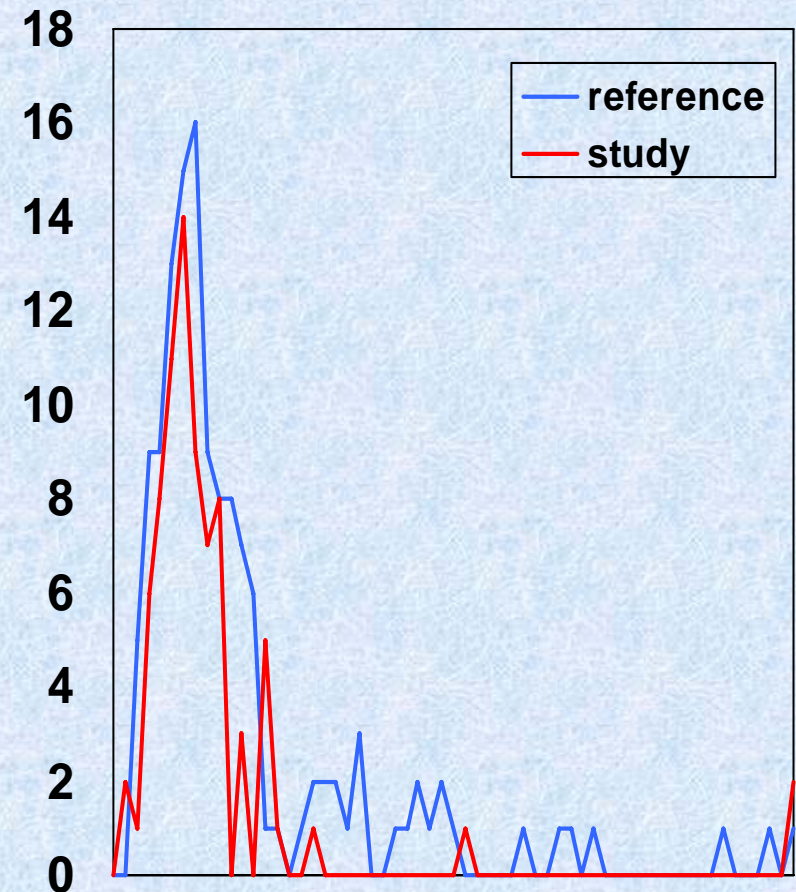


# Lumbar spinal canal stenosis



# Post-surgery acute hospital stay

	Reference	Study group
Number of operation	133	100
Percentage of total operation	23	29
Mean (days)	12.4	8.6
Median (days)	8	7
Mode (days)	8	7



# Clinical Improvement

- Before operation
  - VAS
    - 7.2
  - JOA score
    - 19.7
  - ODI
    - 43.8
- At last follow-up
  - VAS
    - 2.6
  - JOA score
    - 25.5
  - ODI
    - 19

Average follow-up duration:  
11.7 months



# JOA score improvement ratio

- Improvement ratio of Hirabayashi

$$\left[ \frac{(\text{post-OT score}) - (\text{pre-OT score})}{29 - (\text{pre-OT score})} \right] \times 100\%$$

$$\left[ \frac{( 25.5 ) - ( 19.7 )}{29 - ( 19.7 )} \right] \times 100\%$$

$$= 62.4 \%$$

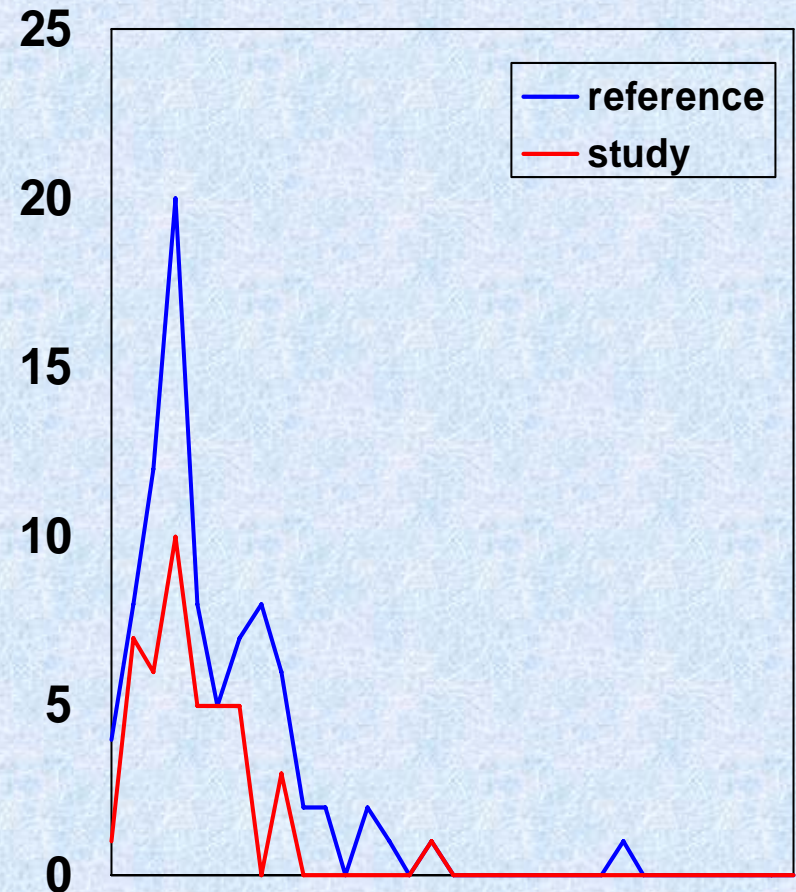


# Lumbar radiculopathy



# Post-surgery acute hospital stay

	Reference	Study group
Number of operation	88	56
Percentage of total operation	15.2	16.3
Mean (days)	6	4.7
Median (days)	4.5	4
Mode (days)	4	3





# Clinical Improvement

- Before operation
  - VAS
    - 7.8
  - JOA score
    - 17.3
  - ODI
    - 49.1
- At last follow-up
  - VAS
    - 1.5
  - JOA score
    - 26.3
  - ODI
    - 8.9

Average follow-up duration:  
9 months



# JOA score improvement ratio

- Improvement ratio of Hirabayashi

$$\left[ \frac{(\text{post-OT score}) - (\text{pre-OT score})}{29 - (\text{pre-OT score})} \right] \times 100\%$$

$$\left[ \frac{( 26.3 ) - ( 17.3 )}{29 - ( 17.3 )} \right] \times 100\%$$

$$= 76.9\%$$



	Reference group mean post-OT stay (days)	Study group mean post-OT stay (days)	Average hospital bed-days saved
<b>Cervical myelopathy (54)</b>	<b>24.3</b>	<b>15.2</b>	<b>491</b>
<b>Lumbar spine canal stenosis (100)</b>	<b>12.4</b>	<b>8.6</b>	<b>380</b>
<b>Lumbar radiculopathy (56)</b>	<b>6</b>	<b>4.7</b>	<b>73</b>



# Patient satisfaction



# Among 50 randomly selected patients who had spine surgery in 2005

- **96%** satisfied with consent procedure, pre-operative preparation and post-operative follow-up arrangements
- **96%** satisfied with the professional care, explanation, education and management delivered by spine surgeons and nurse specialist
- Given the choice again, **90%** would choose to have the same operation



# Conclusion



# The implementation of the spine surgery service plan apparently has

- reduced the incidence of major surgical complications
- reduced hospital stay
- generated objective satisfactory clinical outcome after surgery
- generated high patient satisfaction



# Limitation and self-criticism





- Experiences of the surgeons
  - Reference group 12.2 years per case
  - Study group 13.4 years per case
- Mobility of the surgeons
  - 3 senior surgeons had left while 3 dedicated spine surgeons added to the pool
- Lack of independence (the auditor involves in operations actively)
- Retrospective nature in reference data collection
- Compliance to the working and auditing protocols
- Avoidance of complications  $\neq$  good clinical outcome
  - Clinical improvement documentation not done in the reference group



# The Future



- The service plan
- The data collection
- The auditing process

**will be continued**

- minimize the avoidable complications
- quality service to be maintained



Thank You

