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Neurogenic myositis ossificans of the hip : correlation between enhanced CT and surgical findings

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SIMS
Société d'Imagerie Musculo-Squelettique

Neurogenic Myositis Ossificans

- Formation of *heterotopic bone* in the *periarticular soft tissue*
- First described *by Marie Déjerine in 1918* in patients with spinal cord injury during first world war
- Occurs after :
  - Severe injury of *central nervous system* most frequently
  - Peripheral nervous system injury
  - Long stay in intensive care unit
  - Skin burns

**Dejerine & al Rev Neurol 1919*

Background

- *Pathophysiology* still poorly understood
- *High incidence**:
  - 8 to 25% after brain trauma
  - 8 to 29% for spinal cord injury
  - 2,5% after stroke
- *Delay of 2-3 months* after injury
- *Diagnosis often delayed*

- *Clinical symptoms:*
  - Onset or increase of *joint limitation*
  - Important *locoregional induration*
  - Local inflammatory signs,fever
  - Periarticular edema
  - Vascular complication
  - Nervous complication

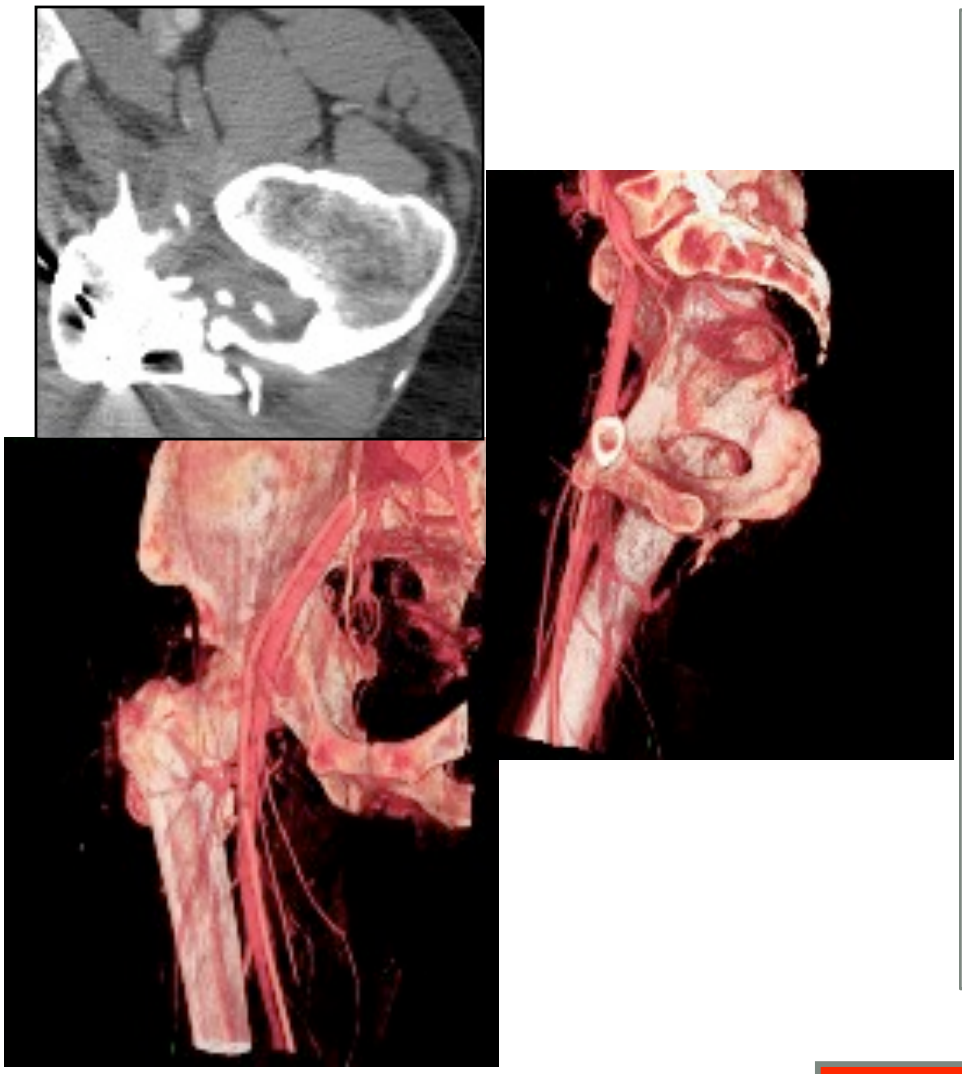
→ **Only curative treatment : surgery**

** Singer & al Br J Hosp Med 1993*

Purposes

- ***Exhaustive description*** of Neurogenic Myositis Ossificans on preoperative CT
- ***Correlation*** between CT and surgical findings
- ***Risk factors*** associated with recurrence of *NMO*

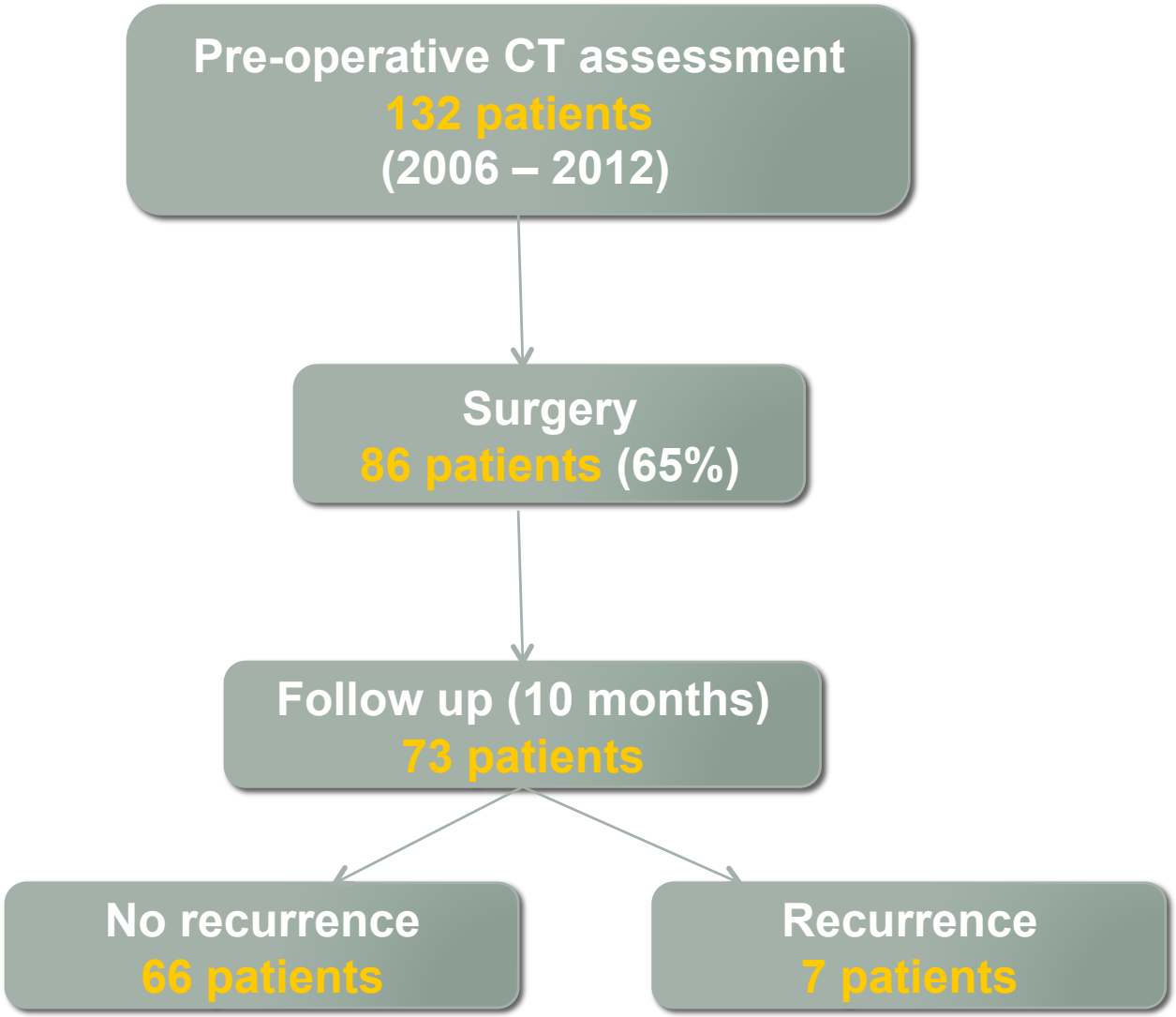
Volume biphasic enhanced CT



- **Location**
- **Maturity of the ossification**
- **Fragmentation/pseudarthrosis**
- **Relationship with blood vessels/ nerves/joint capsule**
- **Bone mineralisation**
- **Thickness of the joint space**

→ Comparison with **surgical report**

Materials et methods



Patients characteristics

	N= 101 patients	%
Sex		
- men	83	82
- women	18	18
Mean age	43	
Bilateral imaging procedure	31	30
Etiology		
- Brain trauma	48	**46,5**
- Spinal cord trauma	8	7,9
-Stroke	21	19,8
- Intensive care	25	**21,7**
- Myositis ossificans progressiva	1	1

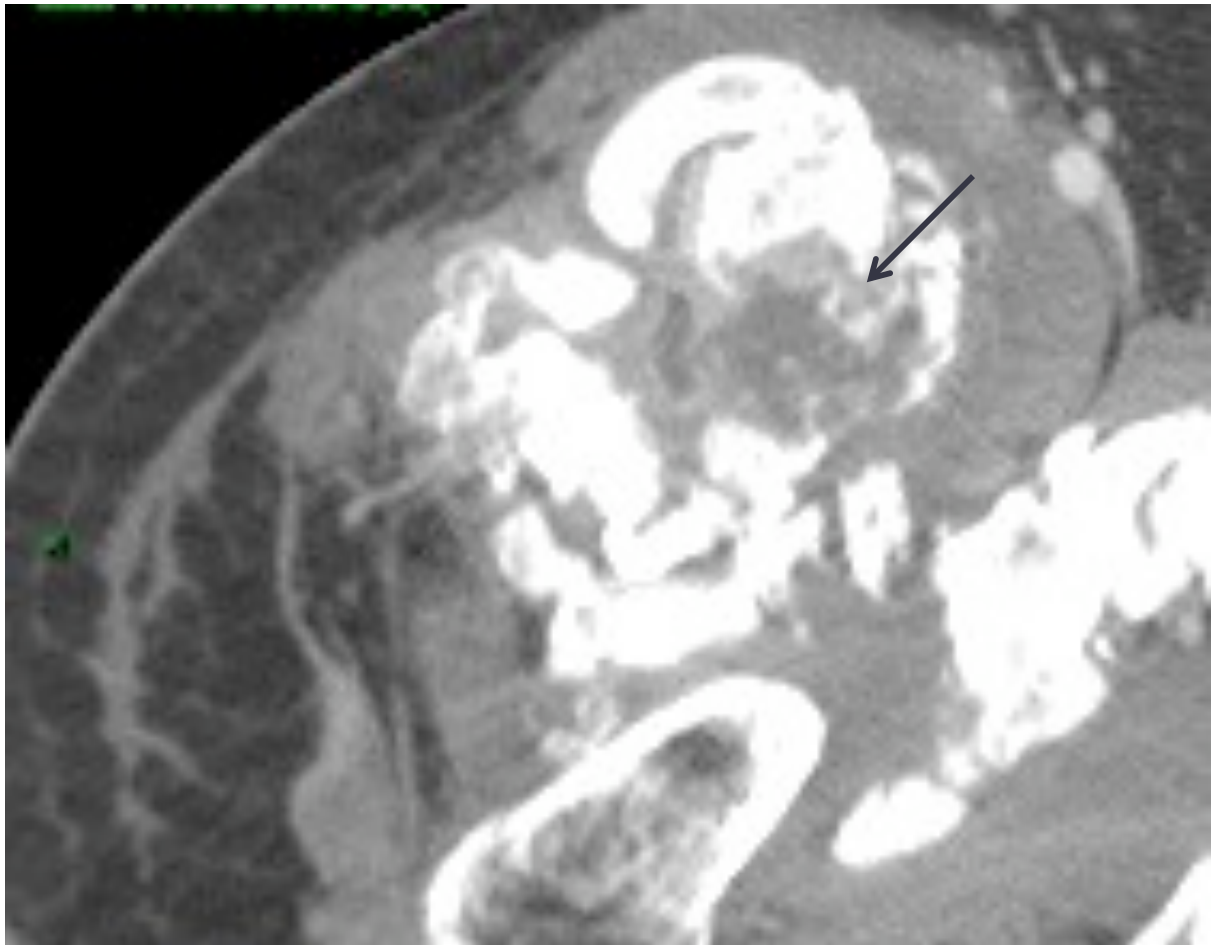
Location

Anterior : **48,5%**

Posterior : **39,4%**

Circumferential : **12,1%**

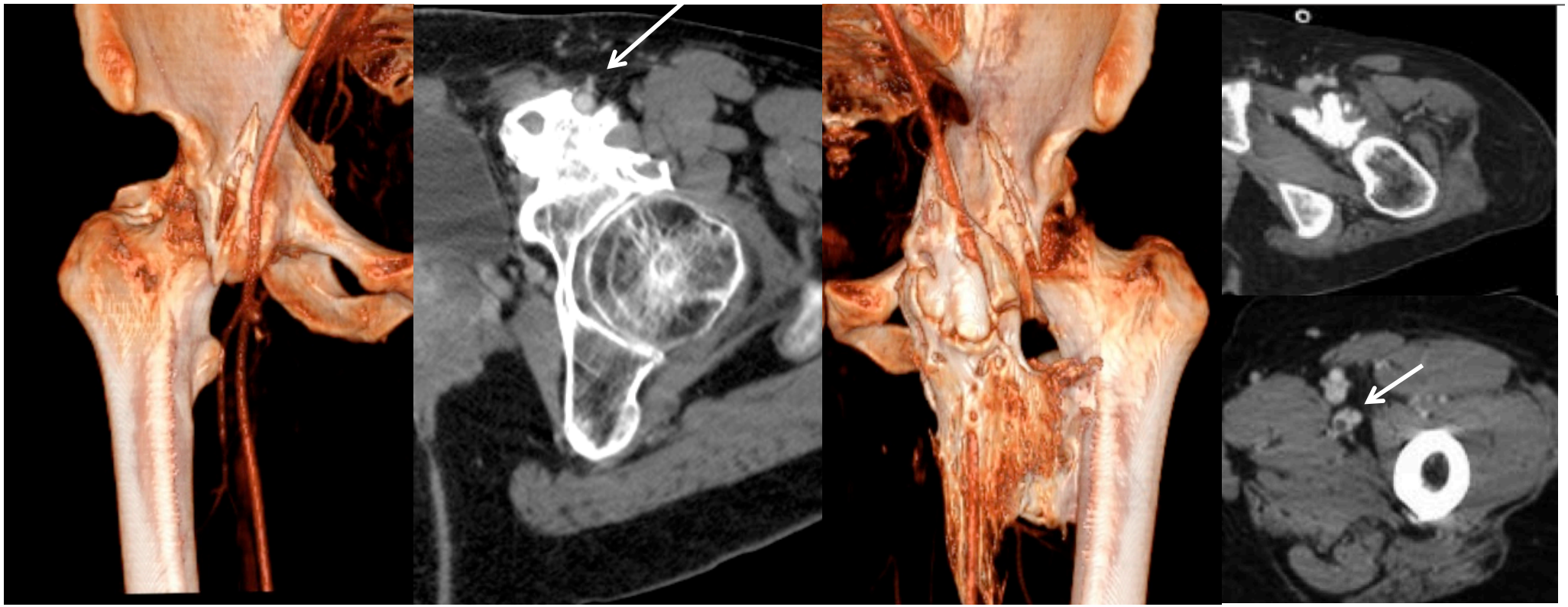
Maturing of the ossification



22,7%

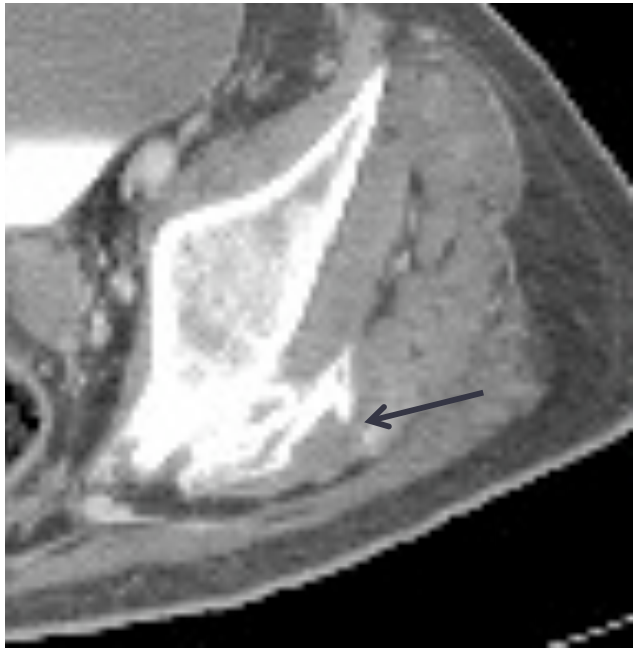
Unmineralized hypodense areas indicating an incomplete ossification

Blood vessels relationship



Displacement: 29,5% | **Groove : 4,5%** | **Channel : 6%** | **Occlusion :2,3%**

Nerves relationship



Displacement: 9%

Groove: 17,4%

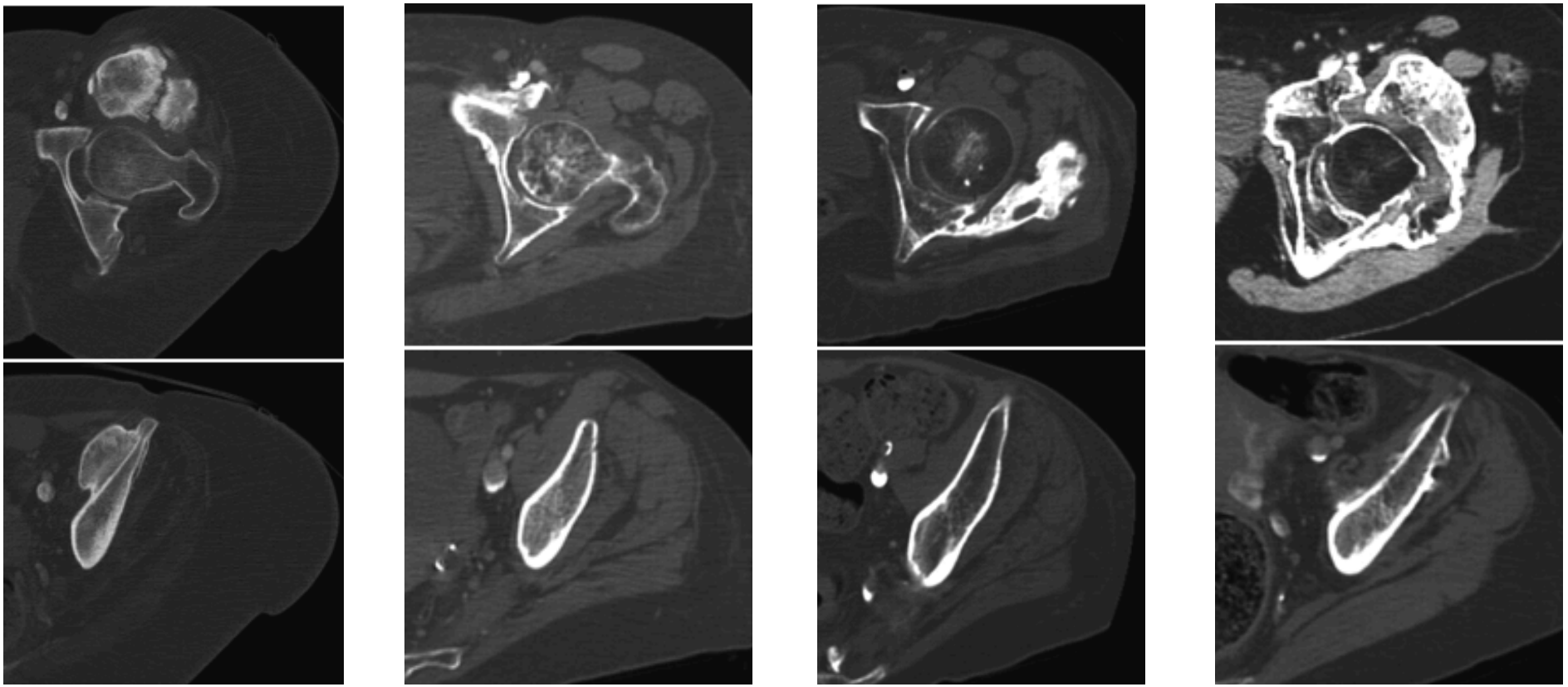
Tunnel: 2,3%

Joint capsule relationship

Contact: 46,2%

Disruption: 18,2%

Bone demineralisation



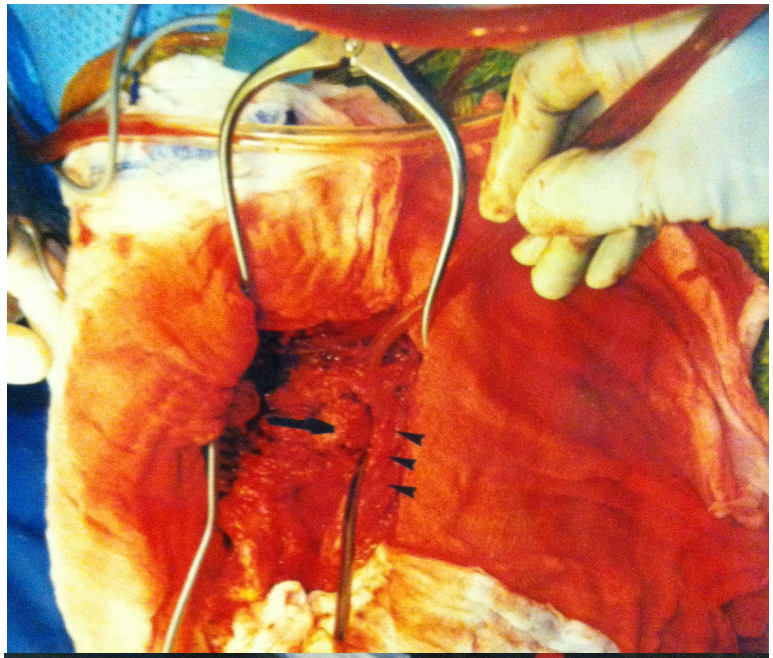
M1: 40,9%

M2: 38,6%

M3:13,6%

M4: 6,8%

Carlier & al J Bone Joint Surg Br 2005



Correlation coefficient between CT and surgical findings

	Surgical report	CT	Kappa
Blood vessels relationship	17		**0,82**
Compression	7		
Groove	4		
Channel	6		
Nervous relationship	30		**0,62**
Compression	12		
Groove	15		
Channel	3	24	
Capsular contact and disruption	16	13	**0,68**

Femoral head fracture and recurrence

Surgical results	n=86 hips	%
Bloodvessels relationship	17	19,7
Compression	7	
Groove	4	
Channel	6	
Nervous relationship	30	34 ,9
Compression	12	
Groove	15	
Channel	3	
Capsular contact or disruption	16	18,6
Complications after surgery	7	8,1
Hemorrhage	3	
Infections	3	
Femoral head fracture	**0**	
Death	1	
Reccurences	7	**8,1**

Correlation between CT and surgical findings

- **Blood vessels relationship**: very good correlation ***(Ķ=0,82)***
- **Joint capsule relationship**: good correlation ***(Ķ =0,68)***
- **Nerves relationship**: good correlation but with an ***overestimation*** of nerve contact ***(Ķ =0,62)***

Risk factors associated with recurrence

Parameters	P
Sex	p=0,336
Location	p=0,744
Pseudo infiltrative appearance	p=0,641
Maturity	p=0,641
Several osseous fragments	p=0,588
Pseudarthrosis	p=0,433
Capsular contact or disruption	p=0,005
Narrowing of joint space	p=0,007
Bone demineralisation	p<0,001
Surgical delay	p=0,171

Discussion

	Carlier JBJS 2005 n=29	Chalidis JNT 2007 n=255	Our study n=101
Male	76%	83%	82%
Mean age	45	31	43
Etiology	TC=41,4 % TM=24%	TM=100 %	TC=46,5 % TM=7,9%
Fracture	13%	NR	0%
Mean surgical delay	24 mois	NR	21 mois
Recurrence	6%	19,8%	8%

Perspectives:

- Improve the **detection** of *Neurogenic Myositis Ossificans*
- Early diagnosis is possible with **ultrasound**
- Early initiation of **non steroid anti-inflammatory therapy**

Conclusion

- Volume CT with biphasic injection : good preoperative assessment of NMO and its complications
- Good correlation with surgical findings: anticipation of hemorrhagic complications and femoral head fracture
- Risk factors of NMO recurrence : *relationship with joint capsule, joint space narrowing* and *bone demineralisation*


Thank you !
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