

Embolisation MSK – veille scientifique

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F.I.R.E22

FUTURE OF INTERVENTIONAL RADIOLOGY EXPERT PANEL

NOVEMBER 24/25th 2022

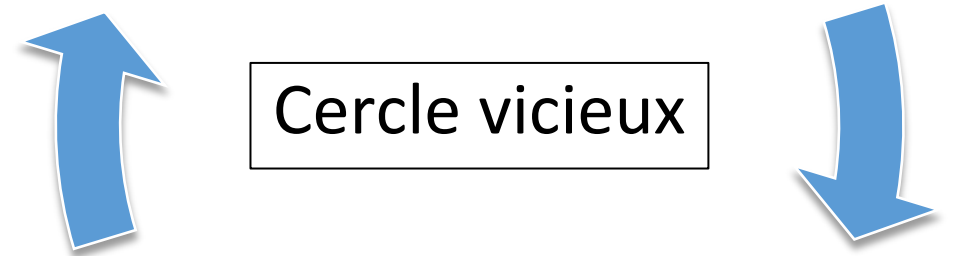
Introduction

- Tendinopathies: inflammation = néovaisseaux
- Embolisation IMP/CS en 2013 (Okuno et al)



Table 1. Clinical Data				
Pt. No./Sex/Age (y)	Pain Duration (mo)	Clinical Diagnosis	Previous Therapies	Therapies at 4 mo
1/F/76	12	Plantar fasciitis	Rest, NSAIDs, CSI	None
2/M/26	20	Iliotibial band syndrome	PT, stretching	PT, stretching
3/F/51	4	Rotator cuff tendinopathy	Rest, NSAIDs, CSI	None
4/M/50	24	Achilles insertion tendinopathy	Rest, stretching	Stretching
5/M/53	3	Patellar tendinopathy	Rest, NSAIDs	None
6/M/58	46	Lateral epicondylitis	CSI	None
7/M/48	3	Rotator cuff tendinopathy	Rest, NSAIDs	None

CSI = corticosteroid injection, NSAID = nonsteroidal anti-inflammatory drug, PT = physical therapy.



Douleur

Croissance nerveuse

Hypothèse: embolisation néo-vaisseaux

Historique

- 2013: Tendinopathies diverses n = 7 (Okuno et al.) IMP/CS
- 2014: capsulite rétractile n = 7 (Okuno et al.) IMP/CS
- 2017: capsulite rétractile n = 25 (Okuno et al.) IMP/CS
- 2017: épicondylite n = 24 (Okuno et al.) IMP/CS
- 2017: gonarthrose n = 95 (Okuno et al.) IMP/CS
- 2018: épaule et coude n = 15 (Hwang et al.) IMP/CS
- 2019: gonarthrose n = 20 (Bagla et al.) Billes
- 2021: gonarthrose n = 38 (Little et al.) Billes
- 2021: capsulite rétractile n = 40 (Fernandez et al.) IMP/CS
- 2021: douleurs épaules post op n = 25 (Fernandez et al.) IMP/CS
- 2021: lombalgies n = 14 (Okuno et al.) IMP/CS
- 2021: rhizarthrose n = 31 (Okuno et al.) IMP/CS
- 2021: gonarthrose n = 40 (Padia et al.) Billes
- 2022: épaule (capsulites + tendinopathies) n = 15 (Gremen et al.) Billes

Rétrospectif

Non contrôlé

Monocentrique

2022 - épaule

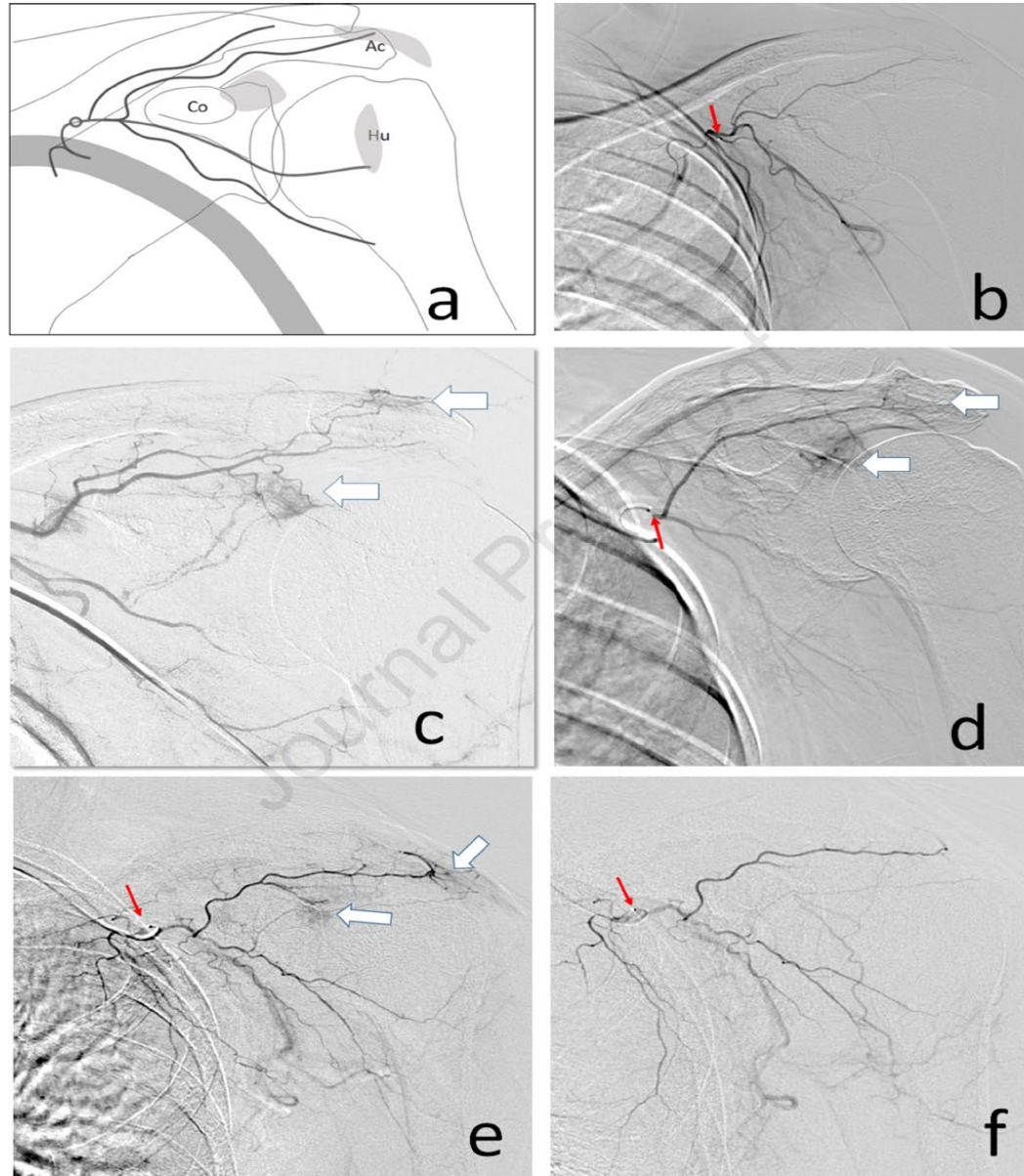
- Capsulites + tendinopathies (Okuno et al. JVIR)

- Multicentrique (5 centres)
- N =100 (76 capsulites, 24 tendinopathies)
- Néovaisseaux (100%)
 - Artère suprascapulaire (57%)
 - Artère thoraco-acromiale (84%)
 - Artère coracoïde (68%)
 - Artère scapulaire circonflexe (43%)
 - Artère humérale circ antérieure (82%)
 - Artère humérale circ postérieure (75%)
- Nombre moyen vx traités = $4,2 \pm 1,1$
- Douleur évoquée (100%)
- 1 cas d'augmentation ALAT M1
- Facteurs prédictifs d'échec clinique:
 - Ancienneté symptômes >2 ans ($p=0,0477$)
 - Diabète ($p=0,0601$)
 - Age >70 ans ($p=0,0728$)

	Baseline	1 month	3 months	6 months	P value
Pain NRS					
Nighttime pain	6.4 ± 2.2	3.4 ± 2.6	2.3 ± 2.5	1.6 ± 2.2	All < 0.001
Resting pain	4.5 ± 2.3	2.7 ± 2.4	1.8 ± 2.2	1.9 ± 1.4	All < 0.001
Motion pain	7.1 ± 1.9	5.1 ± 2.2	3.5 ± 2.3	2.5 ± 2.1	All < 0.001
ROM					
AE	$97^\circ \pm 29^\circ$	$119^\circ \pm 28^\circ$	$135^\circ \pm 27^\circ$	$151^\circ \pm 17^\circ$	All < 0.001
ER	$16^\circ \pm 20^\circ$	$27^\circ \pm 20^\circ$	$38^\circ \pm 19^\circ$	$50^\circ \pm 17^\circ$	All < 0.001
EQ-5D	0.63 ± 0.17	0.73 ± 0.16	0.80 ± 0.17	0.84 ± 0.17	All < 0.001

2022 - épaule

- Okuno et al. JVIR 2022
- 100 patients



2022 - Genou

- Gonarthrose (Bagla et al. JVIR)
 - Randomisé, n =21

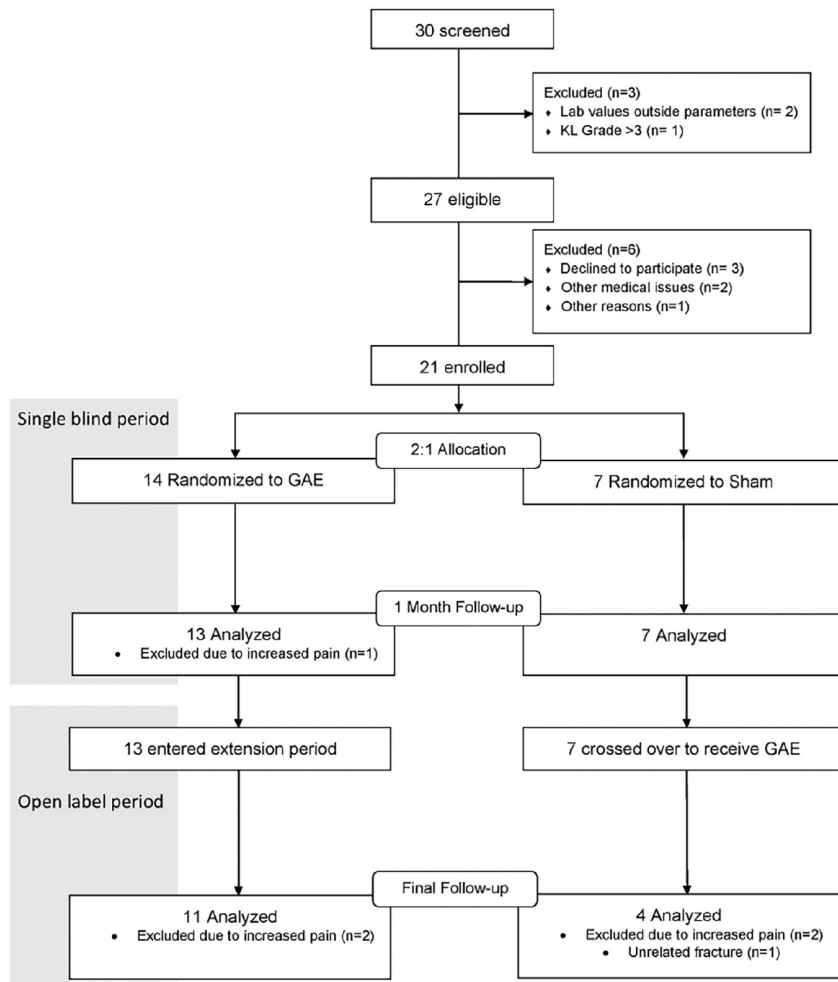
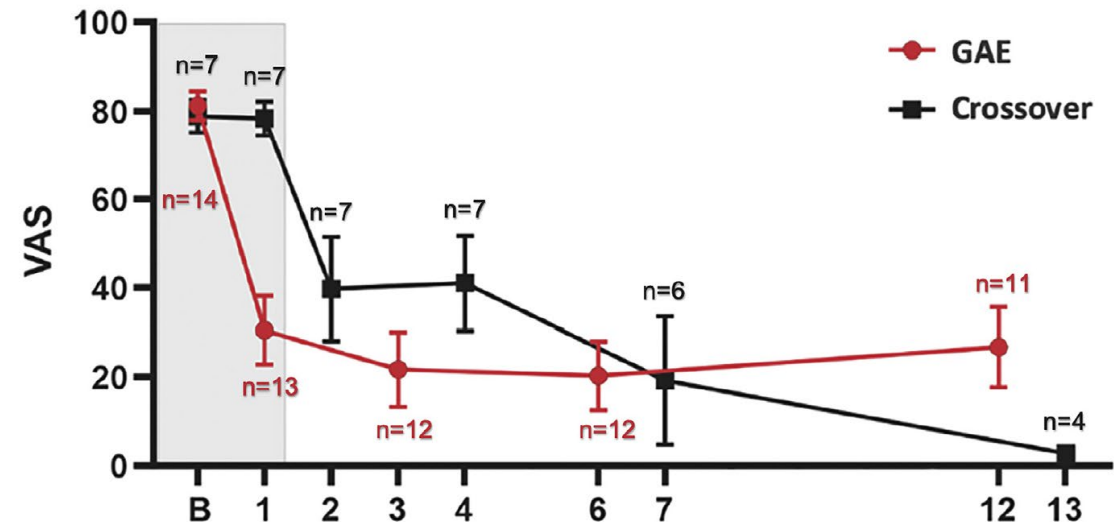


Table 2. Comparison of the First-Month VAS and WOMAC Scores

GAE vs sham	GAE group mean, SE			Sham group mean, SE			Difference in change
	Baseline (n = 14)	1 month (n = 13)	Change	Baseline (n = 7)	1 month (n = 7)	Change	
VAS	81.3, 3.1	30.5, 7.4	50.8	78.9, 3.4	78.4, 3.6	0.7	50.1 (95% CI, 29.0, 72.3; $P < .01$)
WOMAC	64.9, 4.3	34.7, 6.4	30.2	70.9, 4.6	65.9, 4.0	5.0	25.2 (95% CI, 3.5, 45.9; $P = .02$)

Crossover vs sham	Crossover group mean, SE			Sham group mean, SE			Difference in change
	Baseline (n = 7)	1 month (n = 7)	Change	Baseline (n = 7)	1 month (n = 7)	Change	
VAS	78.4, 3.6	39.8, 10.8	38.6	78.9, 3.4	78.4, 3.6	0.7	38.1 (95% CI, 13.3, 62.9; $P < .01$)
WOMAC	65.9, 4.0	46.3, 10.4	19.6	70.9, 4.6	65.9, 4.0	5.0	14.6 (95% CI, -9.7, 38.8; $P = .23$)

CI = confidence interval; GAE = genicular artery embolization; SE = standard error; VAS = visual analog scale; WOMAC = Western Ontario and McMaster Universities Osteoarthritis Index.



IMP/CS versus Billes

- Série grenobloise: 29 patients – capsulite ou tendinopathie (*révisions majeures CVIR 2022*)
- Succès clinique: satisfait oui/non et sensation d'amélioration de la douleur oui/non

> J Shoulder Elbow Surg. 2009 Nov-Dec;18(6):927-32. doi: 10.1016/j.jse.2009.03.021. Epub 2009 Jun 16.

Minimal clinically important differences (MCID) and patient acceptable symptomatic state (PASS) for visual analog scales (VAS) measuring pain in patients treated for rotator cuff disease

Robert Z Tashjian ¹, Julia Deloach, Christina A Porucznik, Amy P Powell

Affiliations + expand

PMID: 19535272 DOI: 10.1016/j.jse.2009.03.021

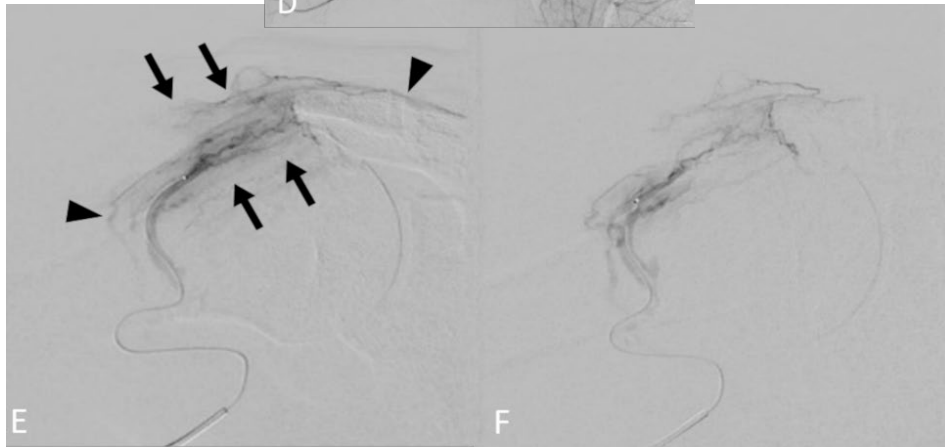
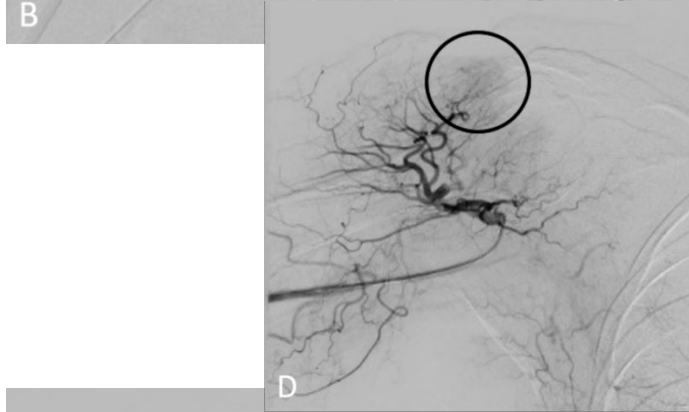
Abstract

Variables	Clinical failure (n=15)	Clinical success (n=14)	p value (univariate)	p value (multivariate)
Age (years), mean (±SD)	49.0 (±8.3)	52.0 (±6.4)	0.28	0.15
Sex, n (%)			0.52	0.57
Men	6 (40)	4 (28.6)		
Women	9 (60)	10 (71.4)		
Duration of symptoms in months, mean (±SD)	34.0 (±30.4)	32.1 (±25.3)	0.86	0.46
Occupational disease, n (%)	4 (26.7)	6 (42.9)	0.36	0.12
History of shoulder surgery, n (%)	8 (53.3)	5 (35.7)	0.34	0.51
Opioid intakes, n (%)	6 (40)	8 (57.1)	0.36	0.36
Baseline VAS, mean (±SD)	76.3 (±12.9)	75.4 (±12.5)	0.84	0.46
Nightpain, n (%)	15 (100)	9 (64.3)	0.01	0.99
Enhancement on baseline MRI, n (%)	10 (66.7)	8 (88.9)*	0.22	0.51
Embolization agent, n (%)			0.02	0.02
Microspheres	11.0 (73.3%)	4.0 (28.6%)		
Imipenem/Cilastatin	4.0 (26.7%)	10.0 (71.4%)		
Number of arteries treated, n (%)			0.81	0.78
One	2 (13.3)	2 (14.3)		
Two	7 (46.7)	8 (57.1)		
Three or more	6 (40)	4 (28.6)		

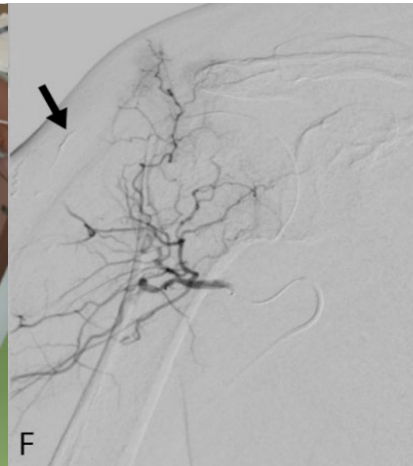
- Score ASES (uniquement groupe IMP/CS):
 - 28.8 ± 12.3 au baseline
 - 39.6 ± 21.3 à 1 mois ($p=0.02$)
 - 39.3 ± 20.3 à 3 mois ($p=0.01$)

Variables	MS group (n=15)	IMP/CS group (n=14)	p value
MCID at 3 months, n (%)	4 (26.7%)	10 (71.4)	0.02
VAS at baseline, mean (±SD)	73.3 (±11.8)	78.6 (±13.1)	0.27
Evolution of VAS compared to baseline, mean (±SD)			
At M1 after embolization	-28.6% (±34.6)	-36.8% (±27.8)	0.50
At M3 after embolization	-29.9% (±29.0)	-39.6% (±23.0)	0.33
At M6 after embolization	-30.6% (±32.8)	-46.6% (±28.4)	0.26
Evolution of analgesic drugs intake, n (%)			
Decrease	5 (33.3)	8 (57.1)	0.19
Stable	10 (66.7)	5 (35.7)	
Increase	0 (0)	1 (7.1)	

IMP/CS versus Billes

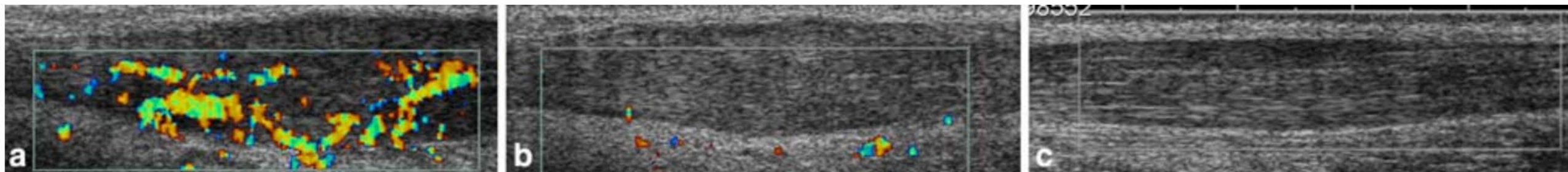


Variables	MS group (n=15)	IMP/CS group (n=14)	p value
Grades 1 and 2 complications, <i>n</i> (%)			
Post embolization syndrome	8 (53.3)	0 (0)	0.002
Transient paresthesia	2 (13.3)	0 (0)	0.48
Radial artery thrombosis	2 (13.3)	2 (14.3)	>0.99
Transient humeral head edema	1 (6.7)	0 (0)	>0.99
Grade 3 complications, <i>n</i> (%)			
Transient skin ischemia	2 (13.3)	0 (0)	0.48
Severe frozen shoulder	0 (0)	2 (14.2)	0.22



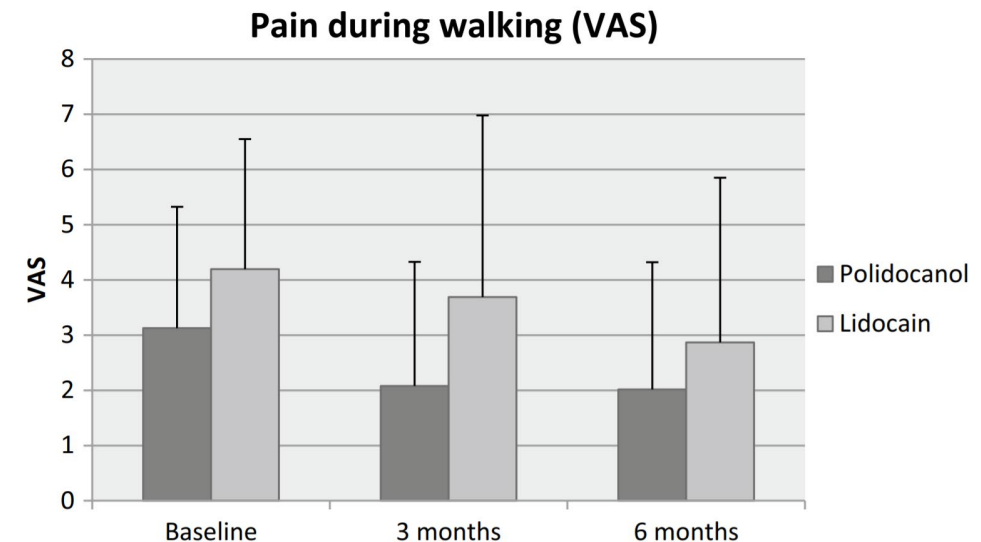
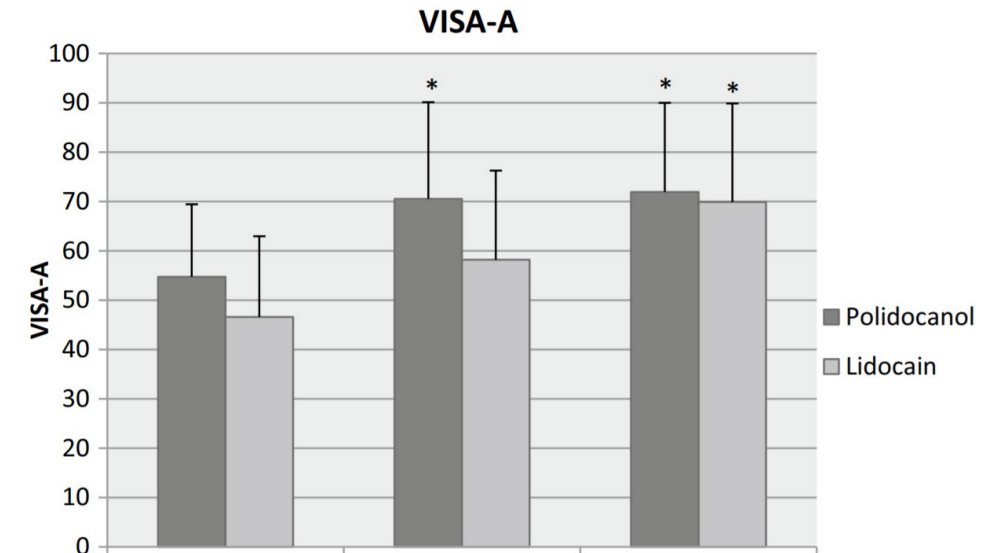
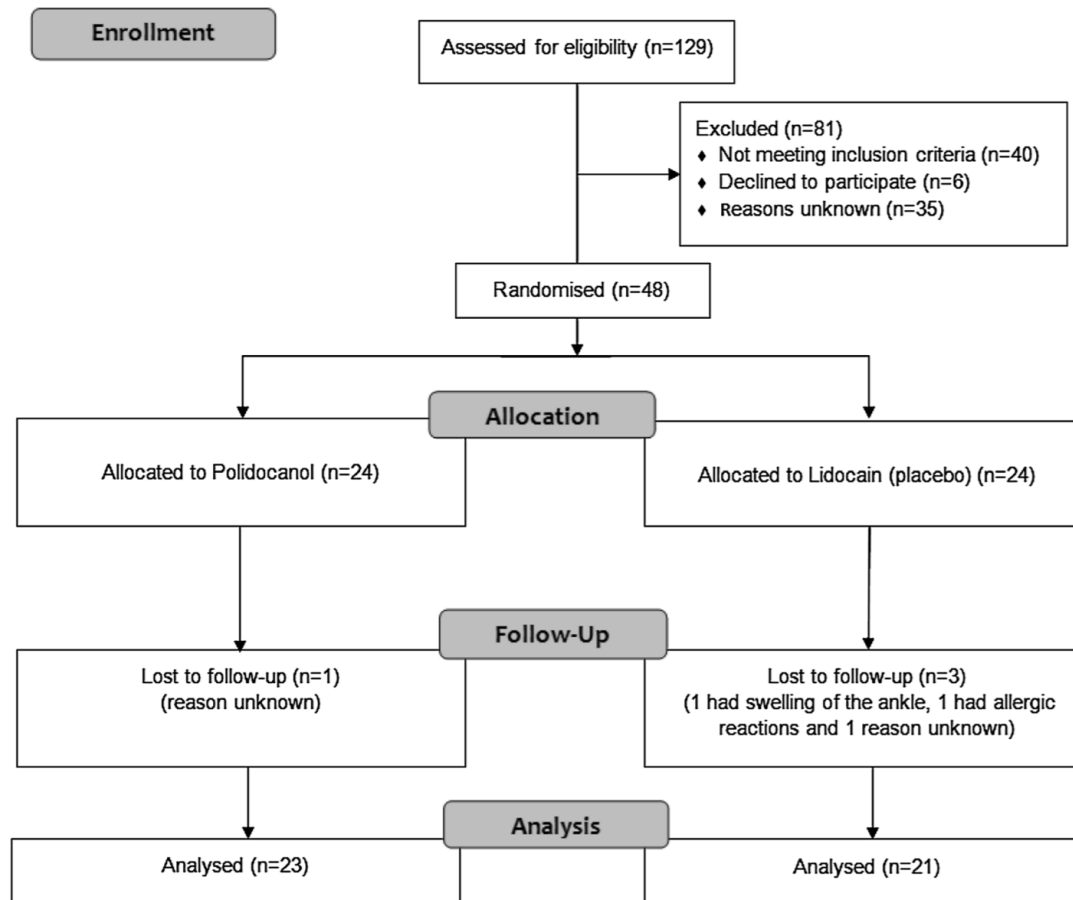
Importance des études randomisées contre sham

- Douleur chronique – effet placebo ?
- Exemple: Sclérose néovaisseaux et tendinopathie achilléenne
- 2006: 42 patients Lind et al.
 - Ancienneté des symptômes: 32 mois
 - Injection Polidocanol
 - 37 patients (88,1%) satisfaits
 - A 2 ans, 38 patients (90,5%) satisfaits et reprise activité sportive
 - VAS de 75 au baseline vs 7 à 2 ans ($p < 0,05$)



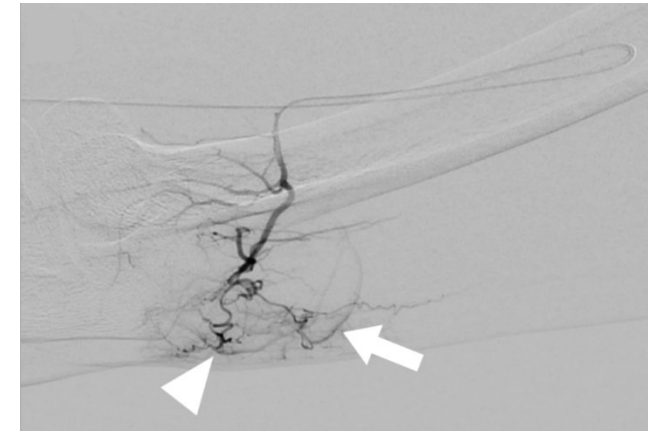
Importance des études randomisées contre sham

- Essai contrôlé randomisé 48 patients (Ebessen et al. Knee Surg Sports Traumatol Arthrosc 2018)



Essais randomisés en cours (ClinicalTrials)

- | | | |
|---|--------------------------|--|
| <ul style="list-style-type: none">• NCT03460665 (Y Cho, Nice) Embargo<ul style="list-style-type: none">• 90 patients: GAE vs sham• Arrêté | Billes 75 μ | Pas d'essai
déclaré
IMP/CS |
| <ul style="list-style-type: none">• NCT04456569 (R Talaie, US University of Minnesota):<ul style="list-style-type: none">• 20 patients: GAE vs traitement symptomatique• Objectif principal: safety | Taille billes ? | |
| <ul style="list-style-type: none">• NCT05423587 (M Little, UK, Genesis II)<ul style="list-style-type: none">• 110 patients, GAE vs sham• Objectif principal: douleur KOOS | Embozen 100 μ | Pas d'essai
randomisé
épaule,
tendinopathie |
| <ul style="list-style-type: none">• NCT04682652 (S Padia, Los Angeles)<ul style="list-style-type: none">• 100 patients: GAE vs surveillance• Cross over possible à 6 mois• Objectif principal: douleur WOMAC | Embozen 100 μ | |
| <ul style="list-style-type: none">• NCT04662840 (Louis Martin Boucher, Mac Gill University)<ul style="list-style-type: none">• 72 patients: GAE vs geniculate nerve ablation vs sham• Objectif principal: VAS, WOMAC et prise d'antalgique | Embosphere 100-300 μ | |
| <ul style="list-style-type: none">• NCT03884049 (Edwin Oei, Rotterdam)<ul style="list-style-type: none">• 58 patients, GAE vs sham• Objectif principal: douleur KOOS | Billes 75-100 μ | |

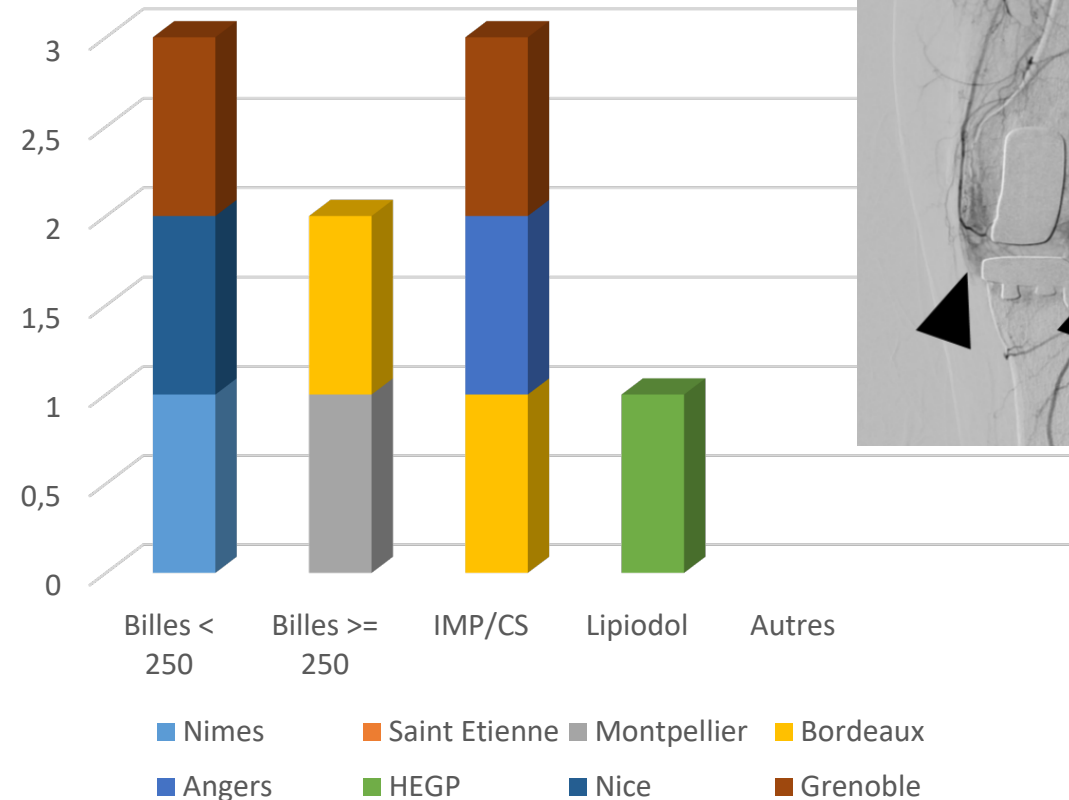
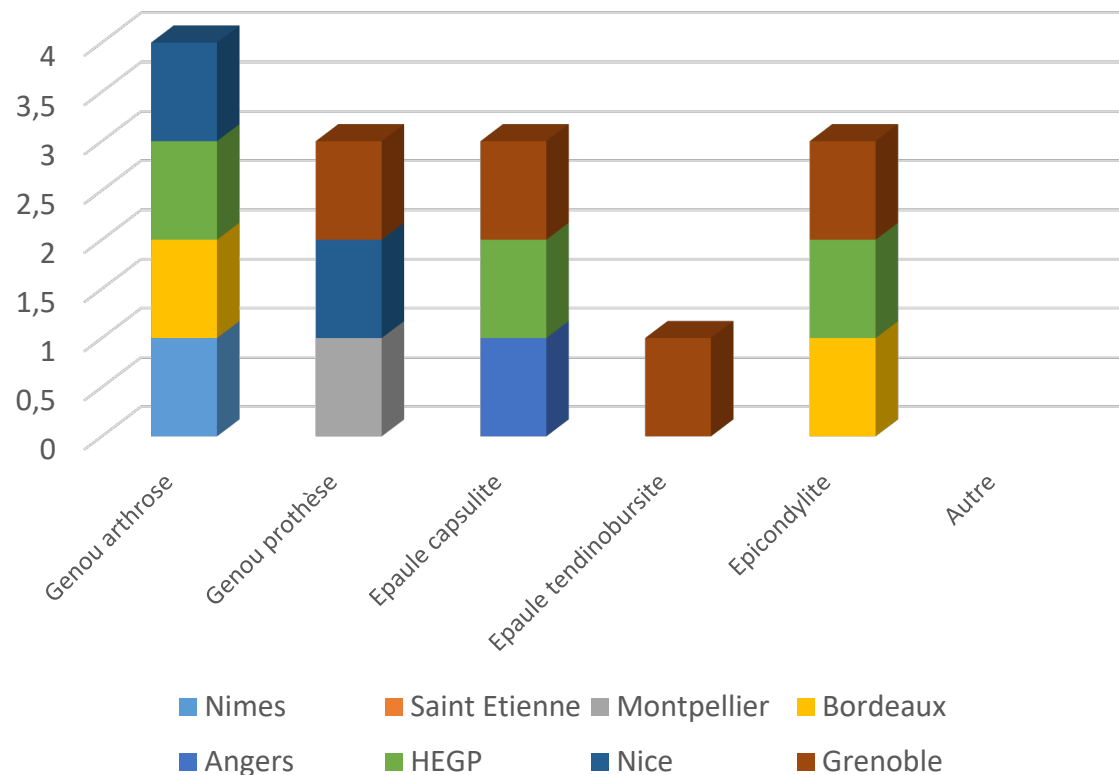


Essais randomisés en cours (ClinicalTrials)

- NCT03884049 (Edwin Oei, Rotterdam): NEO Trial = Neovascularization Embolization for knee Osteoarthritis trial
 - 58 patients, GAE vs sham
 - Arthrose légère ou modérée
 - Sham: drap chirurgical, casque, anesthésie locale, incision inguinale, faux CBCT, temps de procédure identique (1-2 heures), prise en charge post op identique
 - Résultats préliminaires à M4 (CIRSE 2022)
 - Réduction moyenne de la douleur
 - Groupe GAE: 21,4 (95% CI 13,9-28,8)
 - Groupe sham: 18,4 (95% CI 11,6-25,1)
 - $P=0,31$
 - Effet placebo ? Attente résultats M12

Perspectives en France

- Demande PHRC – LI octobre 2022:
 - Douleur prothèse de genou billes (Nice)
 - Gonarthrose Lipiodol (HEGP)
- Hétérogénéité des pratiques



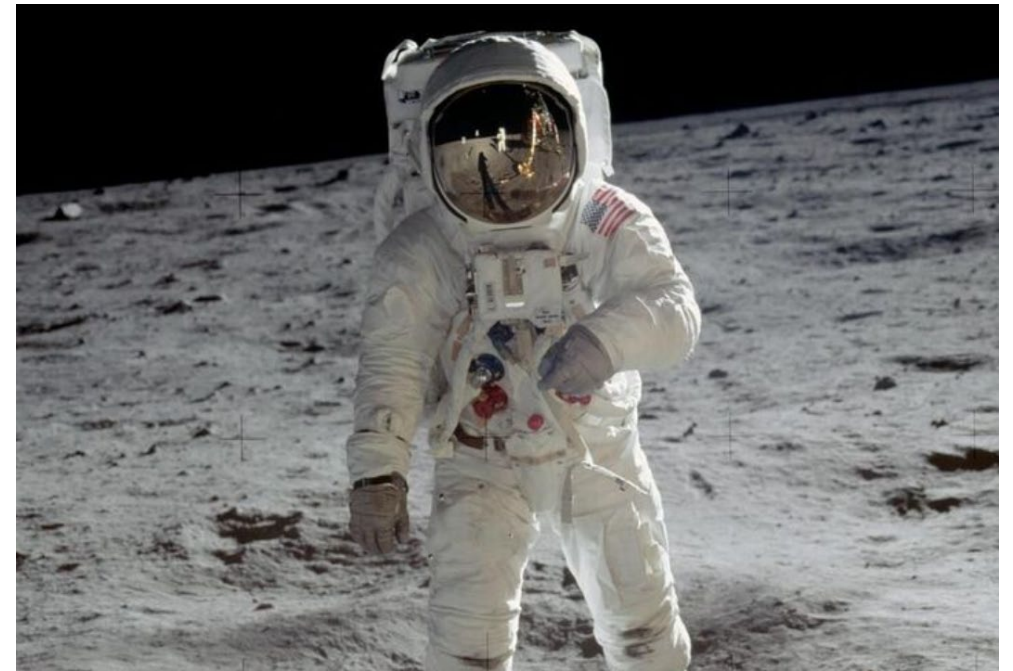
Perspectives en France

- GREOS: Groupe de Recherche et Evaluation de l'embolisation en pathologie OSTéo-articulaire
 - Première réunion 8/09/2022
 - Objectifs:
 - Homogénéiser les pratiques
 - Partager les expériences
 - Mutualiser les données
 - Groupes de travail (genou, épaule, coude)
 - Exemple épaule: Angers, Paris, Bordeaux, Grenoble
 - Utilisation IMP/CS
 - Intérêt angio-CT pré-op
 - Documentation bactériologique des patients

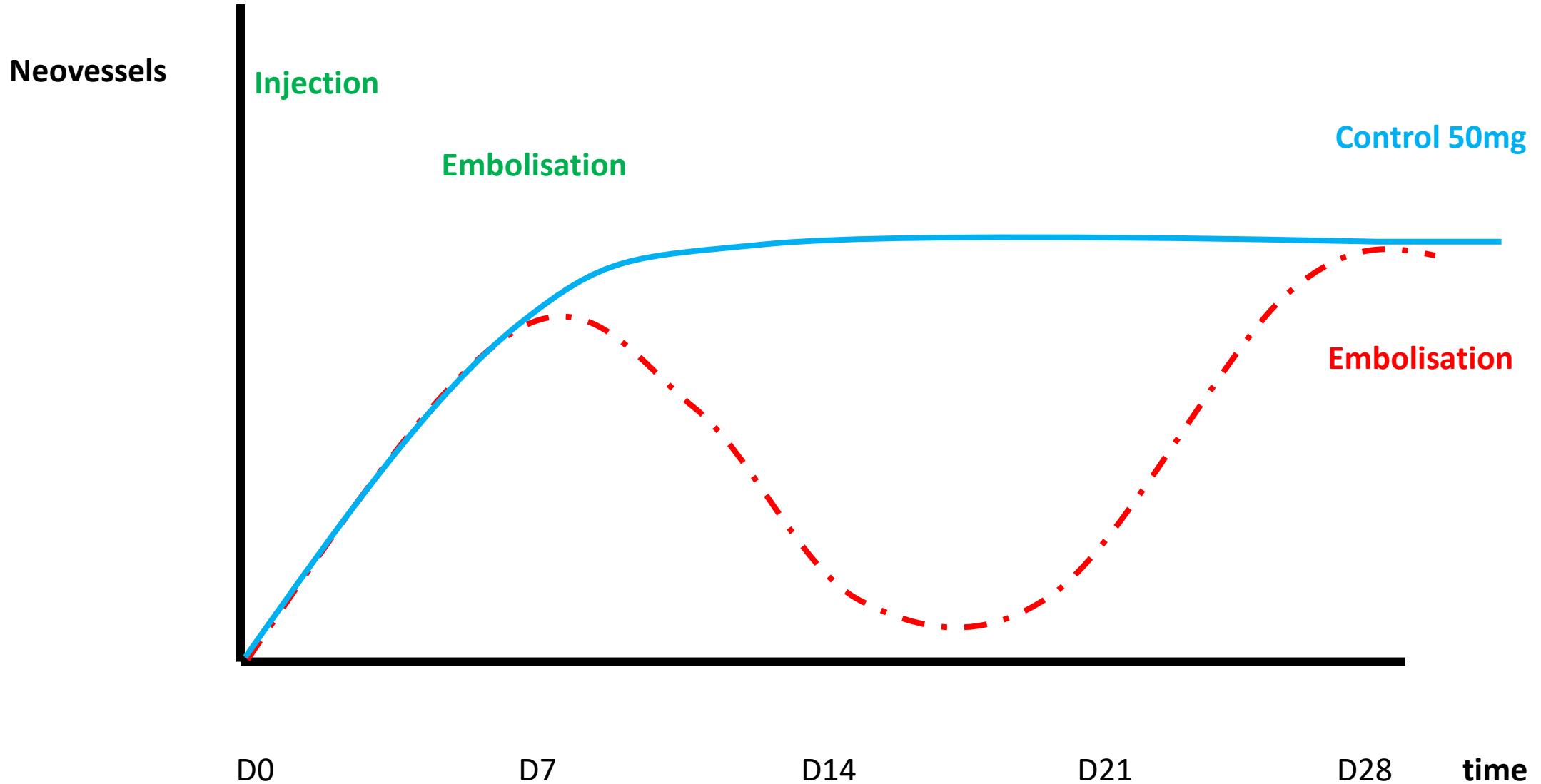


Conclusion

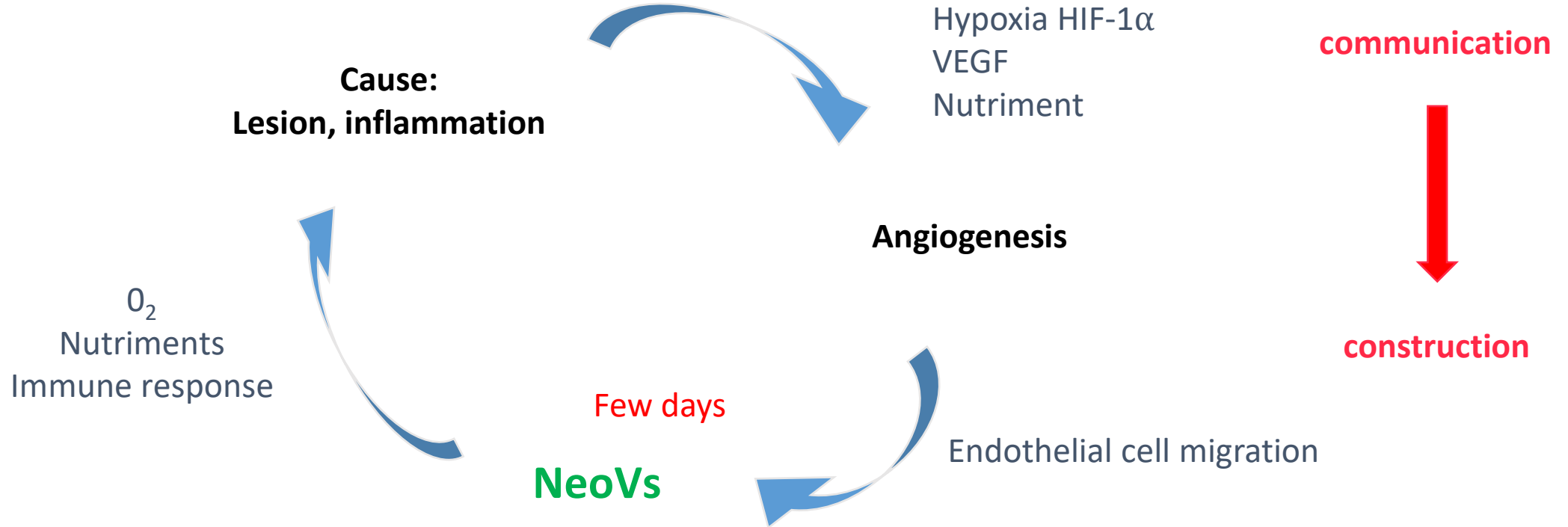
- 9 ans après les premières publications, résultats prometteurs
- Pas d'étude à haut niveau de preuve
- Nécessité d'essais randomisés contrôlés
- Homogénéisation des pratiques et mutualisation des données en France (GREOS)
- Quelle cible ? Néovaisseaux ?



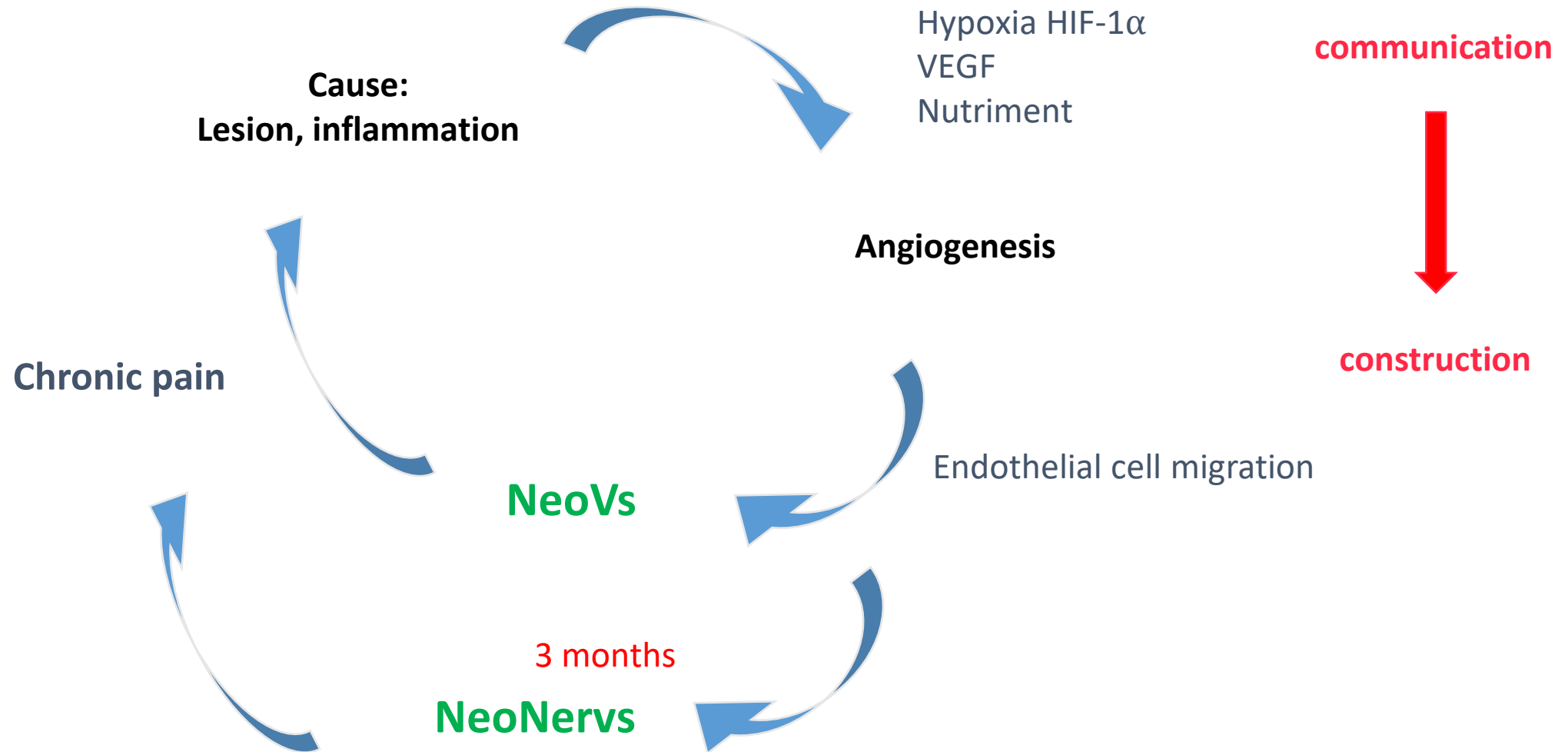
Neovessel and time



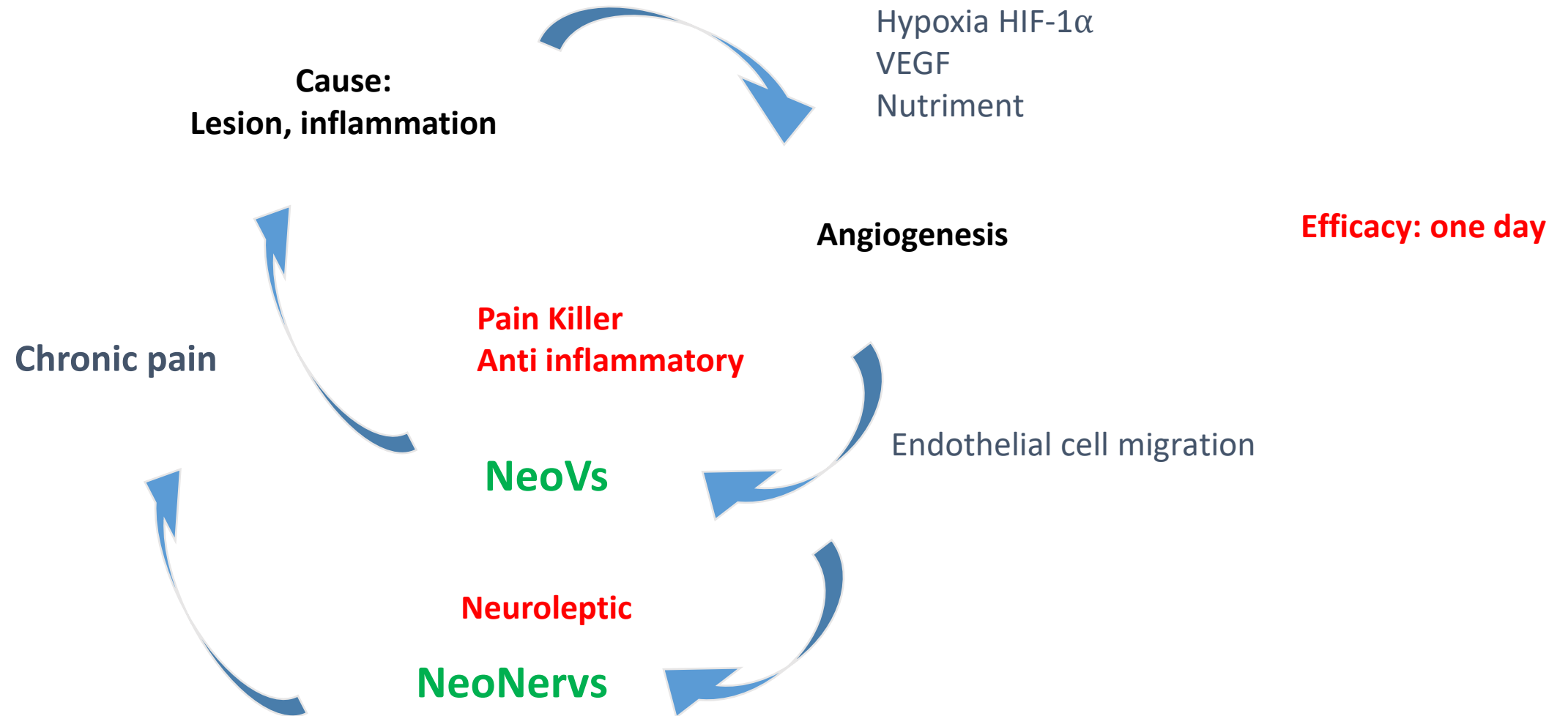
Embolization and neovessels



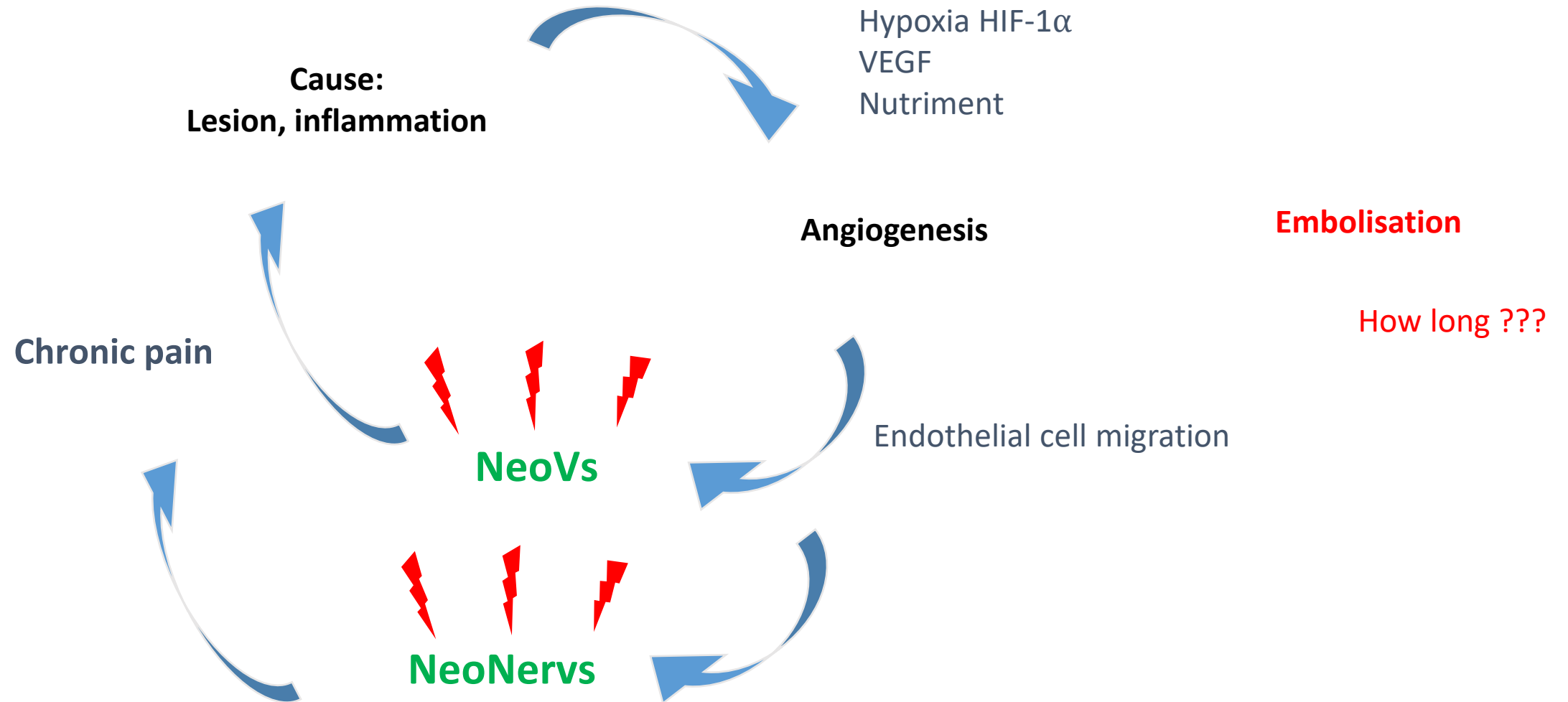
Embolization and neovessels



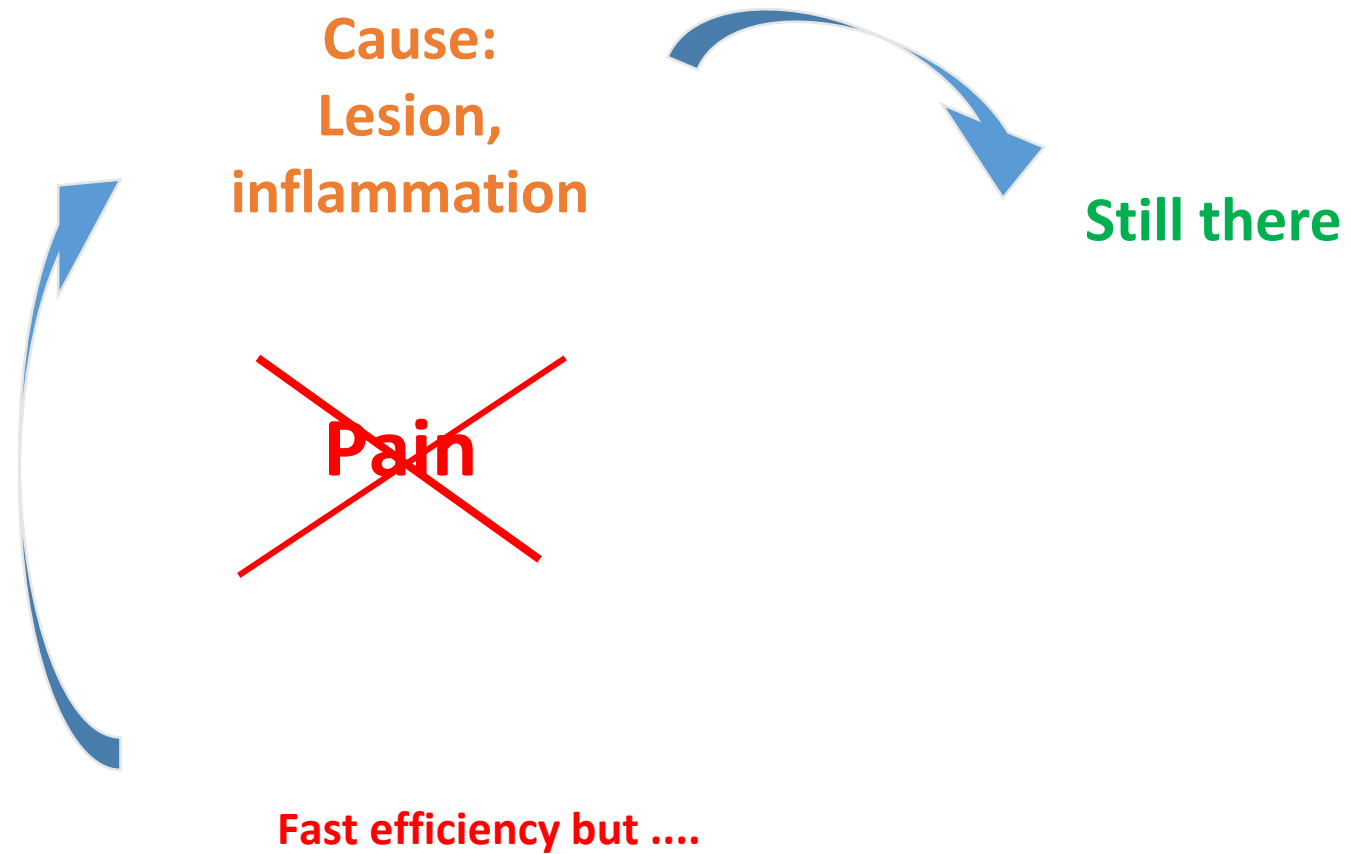
Embolization and neovessels



Embolization and neovessels



Embolization and neovessels



Embolization and neovessels

**Cause:
Lesion,
inflammation**

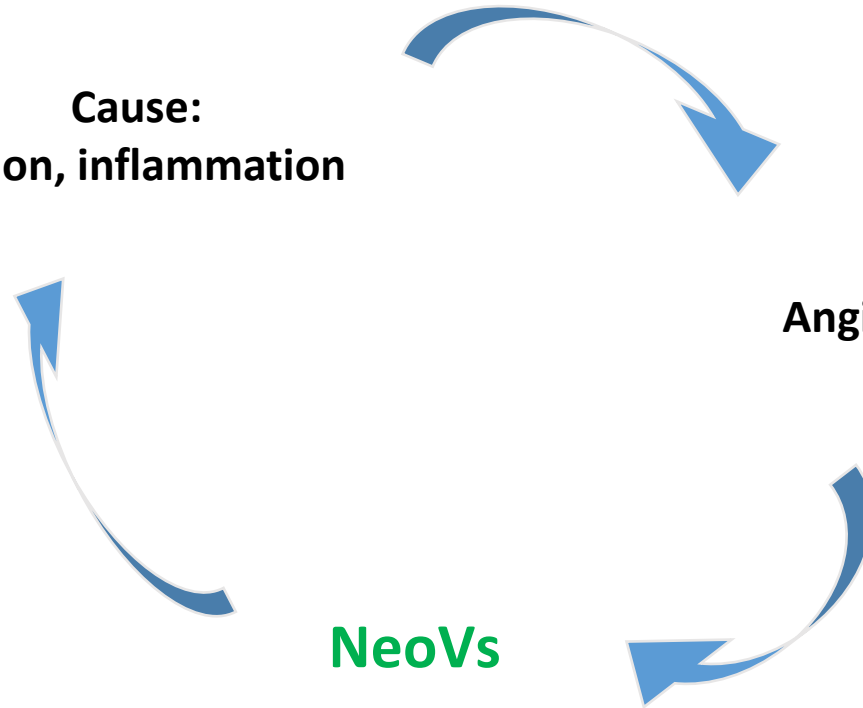
7- 14 days

Neovs

**Cause:
Lesion, inflammation**

NeoVs

Angiogenesis



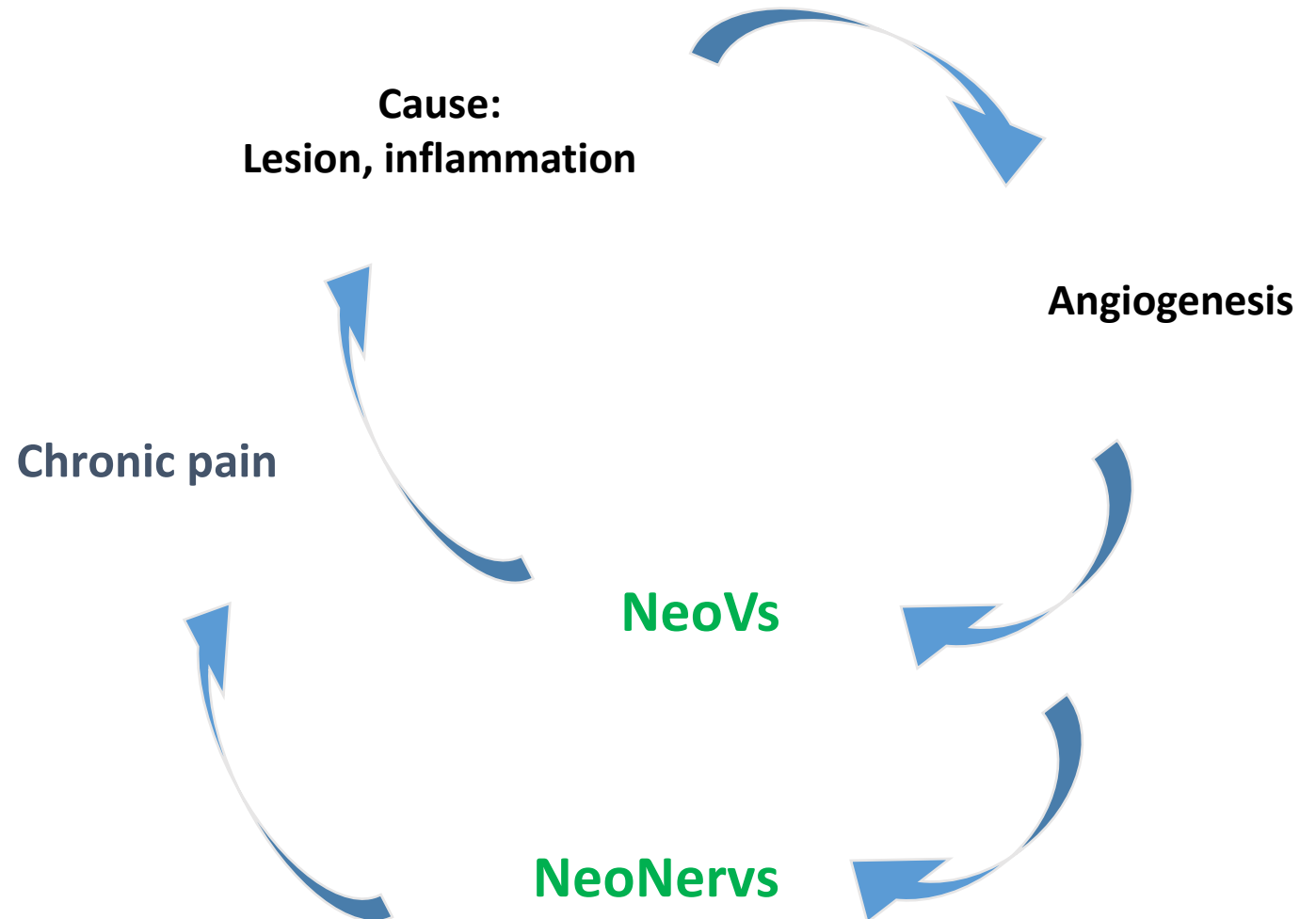
Embolization and neovessels

**Cause:
Lesion,
inflammation**

14 days

+ 3 months

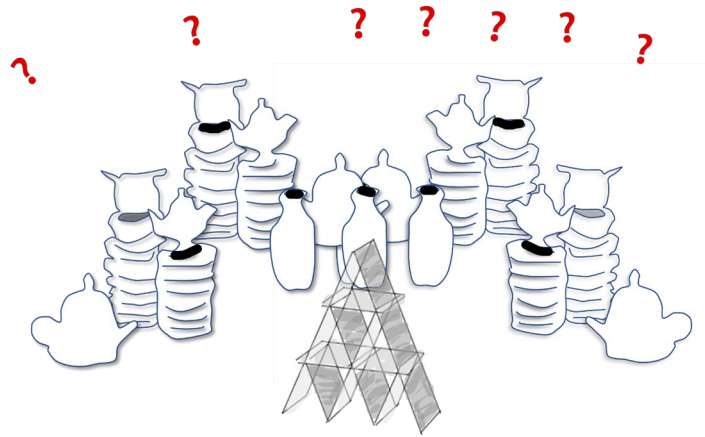
Neonervs



Embolization and neovessels

VAS ??

Neovessels



Pathological vs physiological

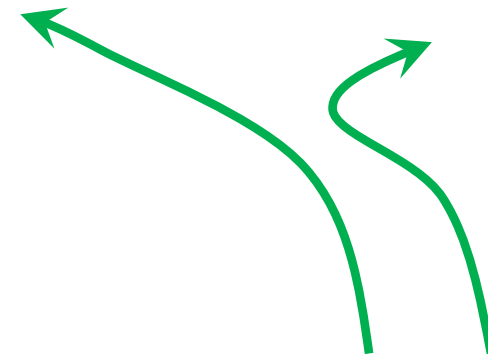
Cause

**Rehabilitation
physiotherapy**

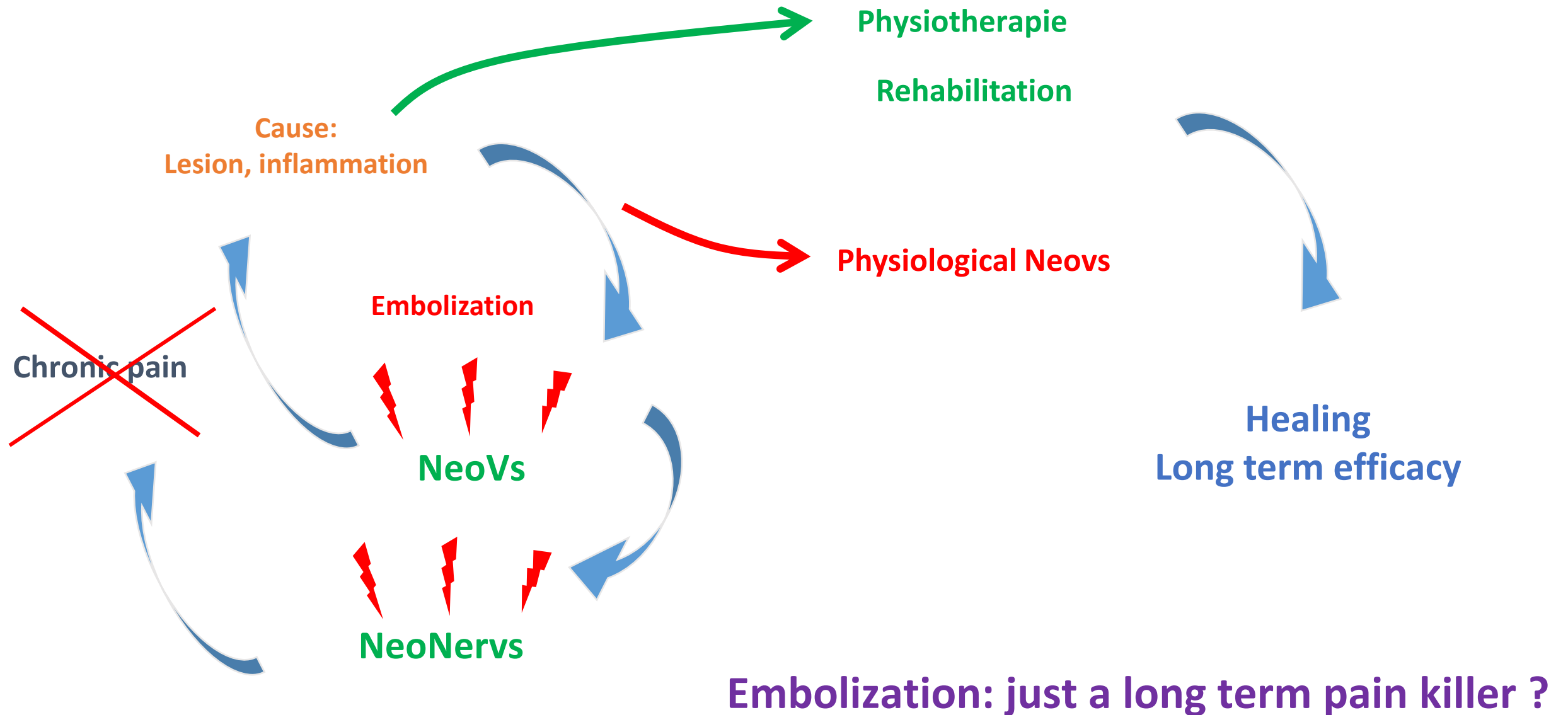
Patient

**Painkillers
Sports
Professional activity**

Monitoring log book



Hypothesis





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