

ASL ROMA 4  
POLO OSPEDALIERO CIVITAVECCHIA - BRACCIANO

# U.O.C. ORTOPEDIA

DIRETTORE: CARMELO D'ARRIGO

2021



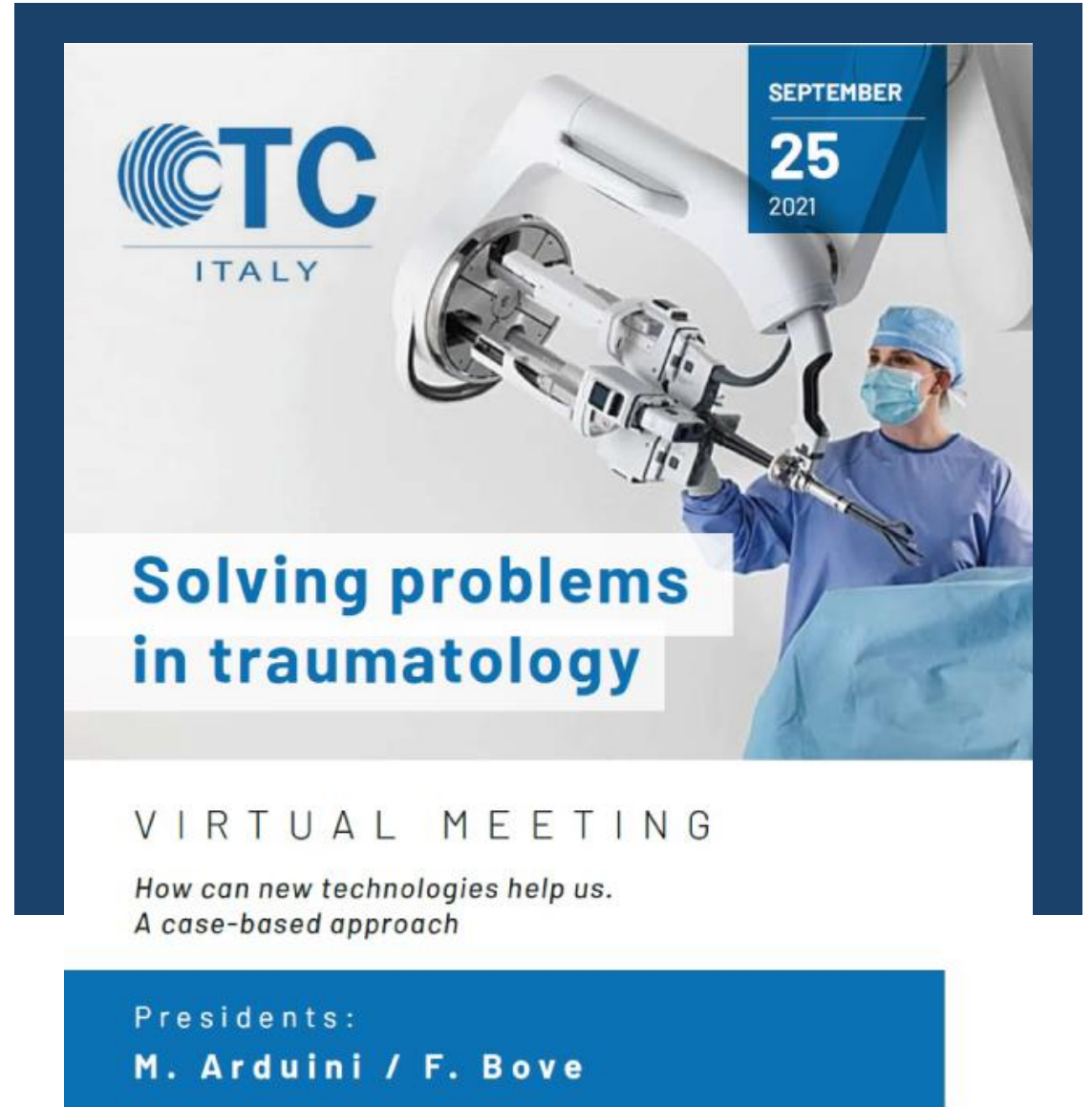
12.05

**COMPUTERIZED  
CRYO-COMPRESSION:** use  
and application in orthopedics  
and traumatology **R. ALONZO**

Dott. Raffaella Alonzo

Dir Med II livello UOC Ortopedia e Traumatologia

Ospedale San Paolo Civitavecchia



**CTC**  
ITALY

SEPTEMBER  
**25**  
2021

## Solving problems in traumatology

VIRTUAL MEETING

*How can new technologies help us.  
A case-based approach*

Presidents:  
**M. Arduini / F. Bove**

# BENEFICI DELLA CRIOTERAPIA

- ✓ Riduce l'edema
- ✓ Riduce l'infiammazione locale
- ✓ Riduce lo spasmo muscolare per via della vasocostrizione riducendo indirettamente la perfusione locale
- ✓ Riduce la velocità della conduzione nervosa



> Am J Orthop (Belle Mead NJ). 2018 Sep;47(9). doi: 10.12788/ajo.2018.0075.

## The Cold, Hard Facts of Cryotherapy in Orthopedics

Lauren E Piana, Kirsten D Garvey, Halle Burns, Elizabeth G Matzkin<sup>1</sup>

Affiliations

PMID: 30296319 DOI: 10.12788/ajo.2018.0075

Currently, cold therapy for pain reduction is an accepted and frequently used treatment in daily practice after trauma or surgery since the time of Hippocrates. Although the mechanism is not well understood, cold therapy has been used for centuries in treatment for pain and swelling. Cryotherapy involves the application of cold to the skin surrounding the injured soft tissues and in joint surgery is supposed to



## Cryotherapy following total knee arthroplasty: What is the evidence?

A Thacoor<sup>1</sup> and NA Sandiford<sup>2</sup>

### Physiology of action

Cryotherapy involves the application of a cold substance, such as ice, to the skin surrounding inflamed soft tissues and joints. The theoretical physiological benefits of clinical cryotherapy have been widely documented since its use in the 1960s and the effects of ice have been demonstrated in several animal and human studies.<sup>8,9</sup> The proposed mechanism of action is that a reduction in temperature reduces intra-articular temperature and limits pain through reducing nerve conduction velocity in addition to promoting immediate vasoconstriction, reducing vascular spasm and slowing down of blood flow, ultimately decreasing tissue edema.<sup>10</sup>

The intra-articular temperature reduction is transient.<sup>11</sup> Studies in animal models have demonstrated that excessively low temperatures or prolonged cooling results in a paradoxical increase in local edema.<sup>12</sup> Despite immediate vasoconstriction and reduction in blood flow, cryotherapy could lead to delayed vasodilation and disruption of secondary hemostasis. Evidence also exists, showing that local application of ice could impair hemostasis, leading to prolonged bleeding time, increased clotting time, reduced platelet aggregation, and increased clot formation time, although this has not been shown to be an issue in patients without pre-existing coagulopathy.<sup>13</sup>

Some authors have reported limited benefit of cryotherapy on alleviating pain<sup>14</sup> or reducing blood loss<sup>15</sup> and inconsistent findings on decreasing swelling and improving mobility<sup>16</sup> post-TKA. The following discussion addresses these issues.



## Reduced opiate use after total knee arthroplasty using computer-assisted cryotherapy

Elke Thijs<sup>1</sup> · Martijn G. M. Schotanus<sup>1</sup> · Yoeri F. L. Bemelmans<sup>1</sup> · Nanne P. Kort<sup>2</sup>

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Received: 4 January 2018 / Accepted: 23 April 2018 / Published online: 3 May 2018  
© European Society of Sports Traumatology, Knee Surgery, Arthroscopy (ESSKA) 2018

[J Athl Train.](#) 2004 Jul-Sep; 39(3): 278–279.

PMCID: PMC522152

PMID: [15496998](#)

## Does Cryotherapy Improve Outcomes With Soft Tissue Injury?

[Tricia J. Hubbard](#)<sup>✉</sup> and [Craig R. Denegar](#)

### Conclusions:

Based on the available evidence, cryotherapy seems to be effective in decreasing pain. In comparison with other rehabilitation techniques, the efficacy of cryotherapy has been questioned. The exact effect of cryotherapy on more frequently treated acute injuries (eg, muscle strains and contusions) has not been fully elucidated. Additionally, the low methodologic quality of the available evidence is of concern. Many more high-quality studies are required to create evidence-based guidelines on the use of cryotherapy. These must focus on developing modes, durations, and frequencies of ice application that will optimize outcomes after injury.

> [Orthop Traumatol Surg Res.](#) 2014 May;100(3):309–12. doi: 10.1016/j.otsr.2013.12.019.  
Epub 2014 Mar 25.

## Cryotherapy with dynamic intermittent compression for analgesia after anterior cruciate ligament reconstruction. Preliminary study

[J Murgier](#)<sup>1</sup>, [X Cassard](#)<sup>2</sup>

Affiliations

PMID: 24679367 DOI: [10.1016/j.otsr.2013.12.019](#)

Comparative Study

> [J Foot Ankle Surg.](#) May–Jun 2018;57(3):436–439.  
doi: 10.1053/j.jfas.2017.08.002.

## The Use of Cryotherapy for the Prevention of Wound Complications in the Treatment of Calcaneal Fractures

[Sanfu Lin](#)<sup>1</sup>, [Junjie Xie](#)<sup>2</sup>, [Xuedong Yao](#)<sup>3</sup>, [Zhangsheng Dai](#)<sup>3</sup>, [Wenhua Wu](#)<sup>4</sup>

Affiliations

PMID: 29685558 DOI: [10.1053/j.jfas.2017.08.002](#)

[Clin Orthop Relat Res](#) (2014) 472:3417–3423  
DOI 10.1007/s11999-014-3810-8

CLINICAL RESEARCH

## Does Advanced Cryotherapy Reduce Pain and Narcotic Consumption After Knee Arthroplasty?

[Emmanuel Thienpont](#) MD, MBA

Clinical Orthopaedics  
and Related Research<sup>®</sup>  
A Publication of The Association of Bone and Joint Surgeons<sup>®</sup>

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 Set exact temperature you want to reach.

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 Improves benefits of cold therapy and healing with 3 levels of air-compression.

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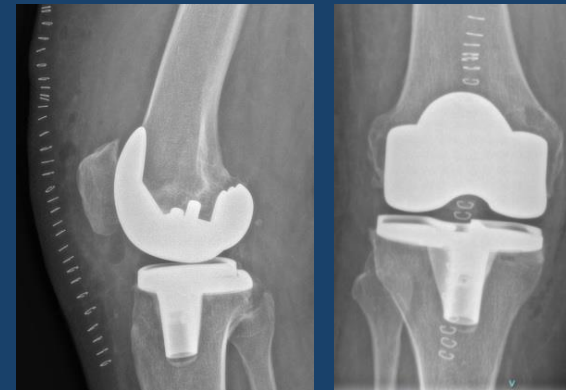


# LA NOSTRA ESPERIENZA



## Traumatologia

utilizzo della crioterapia computerizzata nel pre e post operatorio nelle fratture dell'arto inferiore (fratture collo piede, gamba e ginocchio)

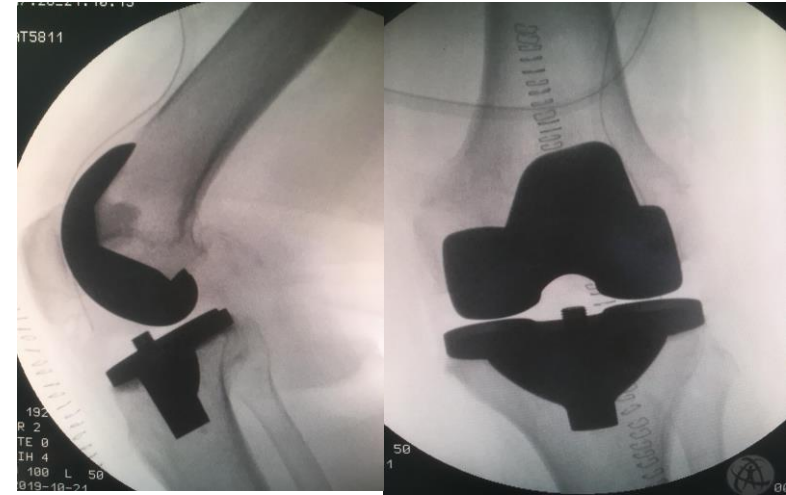


## Ortopedia

Utilizzo della crioterapia nel post operatorio nelle tka

# Utilizzo crioterapia computerizzata in Ortopedia

*How can new technologies help us  
A case-based approach*



## End point primario

VAS post operatoria e l' utilizzo di oppioidi e Fans

Knee Surgery, Sports Traumatology, Arthroscopy (2019) 27:1204–1212  
<https://doi.org/10.1007/s00167-018-4962-y>

KNEE



## Reduced opiate use after total knee arthroplasty using computer-assisted cryotherapy

Elke Thijs<sup>1</sup> · Martijn G. M. Schotanus<sup>1</sup> · Yoeri F. L. Bemelmans<sup>1</sup> · Nanne P. Kort<sup>2</sup>

Received: 4 January 2018 / Accepted: 23 April 2018 / Published online: 3 May 2018  
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### Abstract

**Purpose** Despite multimodal pain management and advances in anesthetic techniques, total knee arthroplasty (TKA) remains painful during the early postoperative phase. This trial investigated whether computer-assisted cryotherapy (CAC) is effective in reduction of pain and consumption of opioids in patients operated for TKA following an outpatient surgery pathway.

## End point secondari

1. ROM
2. Infezioni



## LA NOSTRA ESPERIENZA

- Tutte le TKA da dicembre 2020 ad oggi
- OA primarie (varo o valgo)
- Stessa equipe da dicembre a oggi
- **Protocollo 3h+3h appena rientrati dalla sala**
- Intervallati da chinesi terapia mattina e pomeriggio
- Deambulazione dalla prima giornata post operatoria
- Profilassi anti TVP con EPBM 8-10 h dall'intervento



# Studio prospettico randomizzato

107 pz ( 7 esclusi poichè non rientravano nei criteri di inclusione)

100 TKA 2 gruppi omogenei per età, comorbidità, BMI e sesso

Gruppo 1 : applicazione della crioterapia computerizzata e pressoterapia

Gruppo 2 : classico ice pack



No blocchi antalgici post operatori



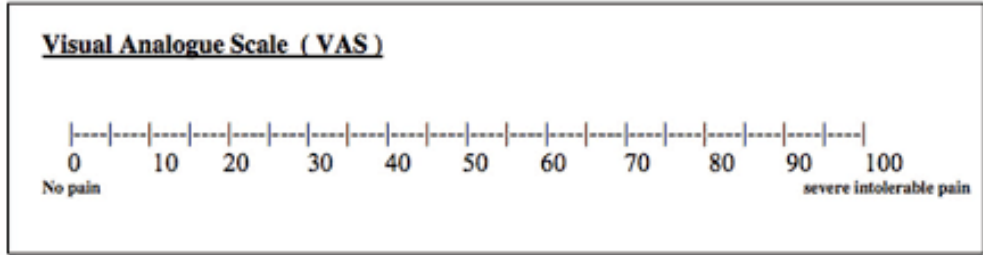
VS



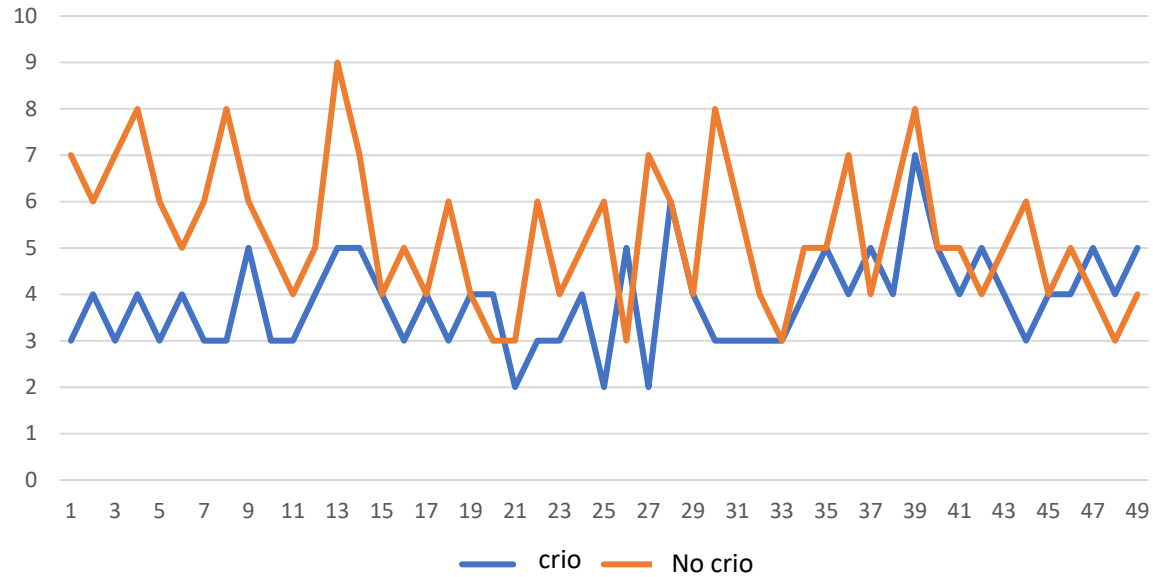
SCHEDA DI CRIOTERAPIA  
PROTESI GINOCCHIO

COGNOME	n. letto
NOME	ETA'
DIAGNOSI	VARO O VALGO
INDICAZIONI	INTERVENTO DATA E TIPO

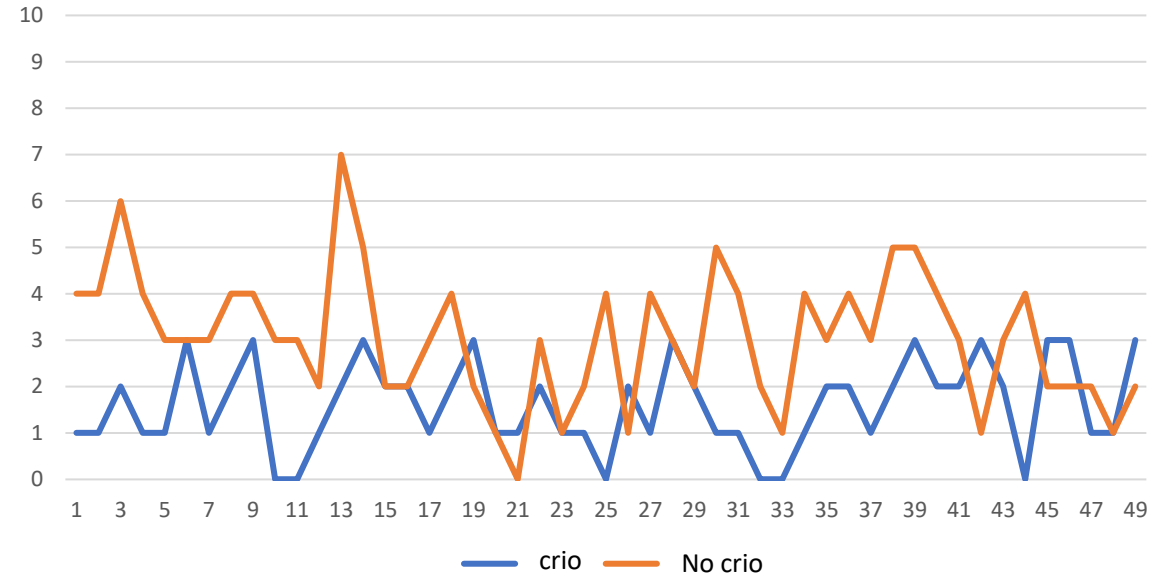
DATA	ORA INIZIO	VAS	ROM	PARACETAMOLO	FANS	TRAMADOLO	MORFINA



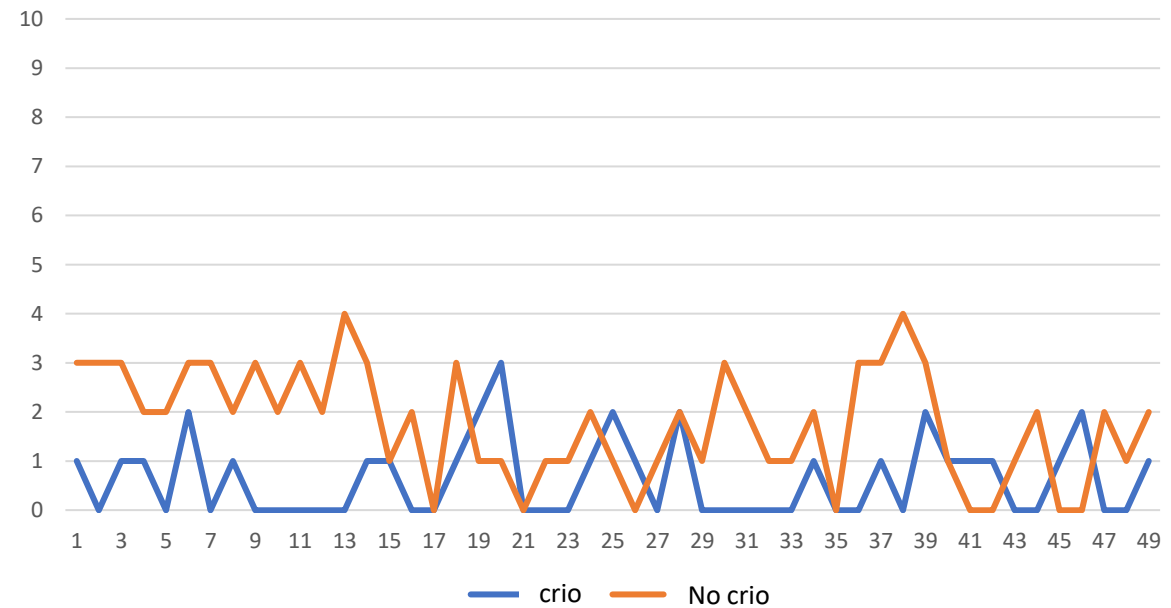
VAS 1 GIORNATA POST OP



VAS 3 GIORNATA POST OP



VAS 5 GIORNATA POST OP



VAS MEDIA	1 giornata	3 giornata	5 giornata
CRIO	3,8	1,5	0,6
NO CRIO	5,3	3	1,75

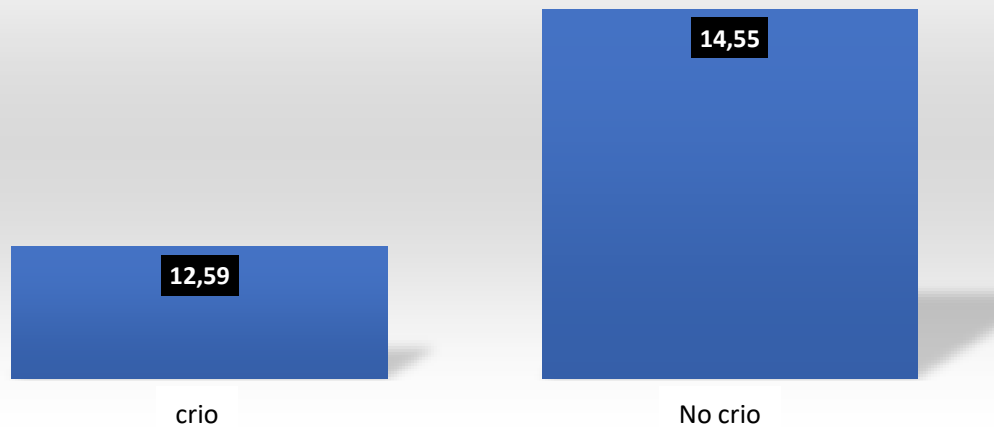
$p < 0,01$

## SOMMA DEI FARMACI ASSUNTI DURANTE LA DEGENZA

	Paracetamolo (g)	Ketorolac (mg)	Tramadolo (mg)	Morfina (mg)
GRUPPO1 (CAC)	12,59	72,85	26,53	0,65
GRUPPO 2 (no CAC)	14,55	118,16	232,65	19,30

**p < 0,01**

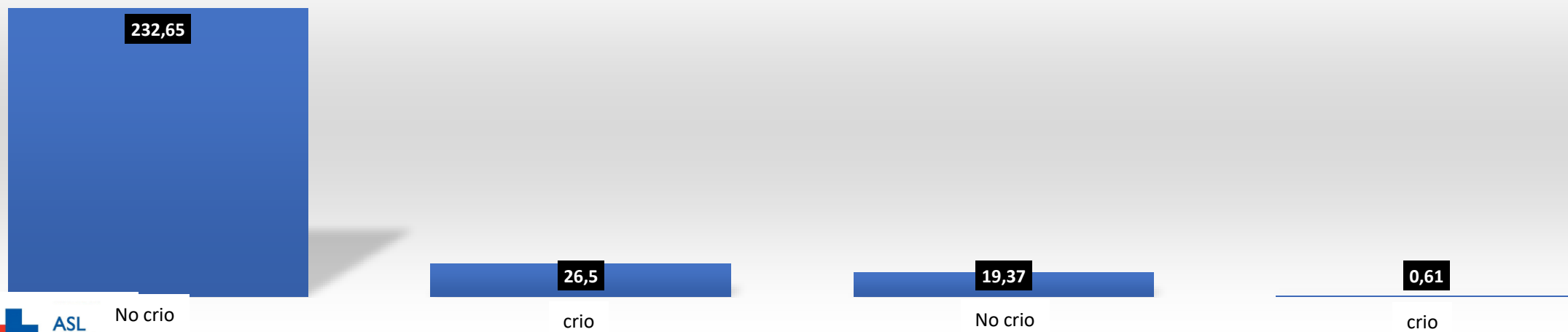
### Grammi totali di Paracetamolo



### Mg totali di Ketorolac

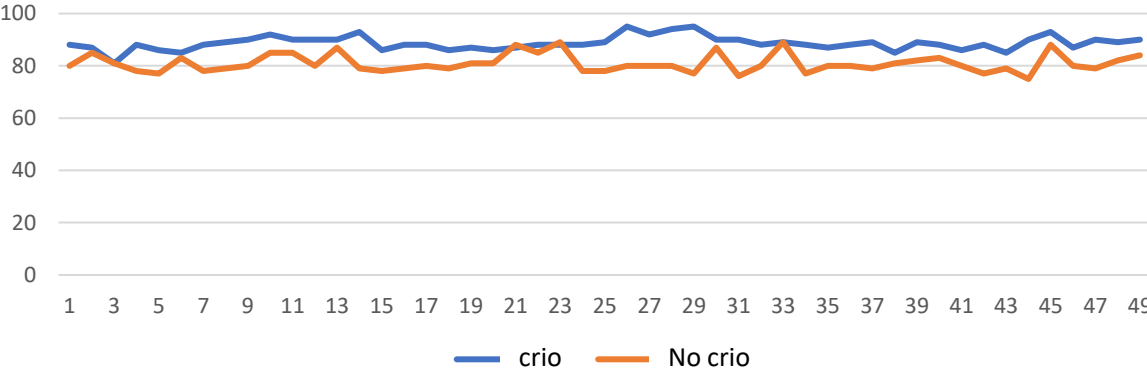


### Mg totali di Tramadolo di Morfina

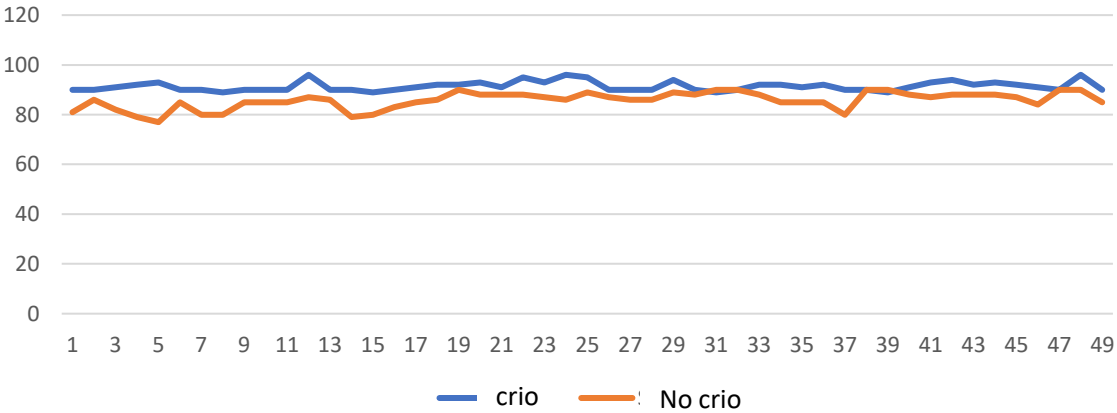


Migliore ROM soprattutto attivo in 3 e 5 giornata post operatoria

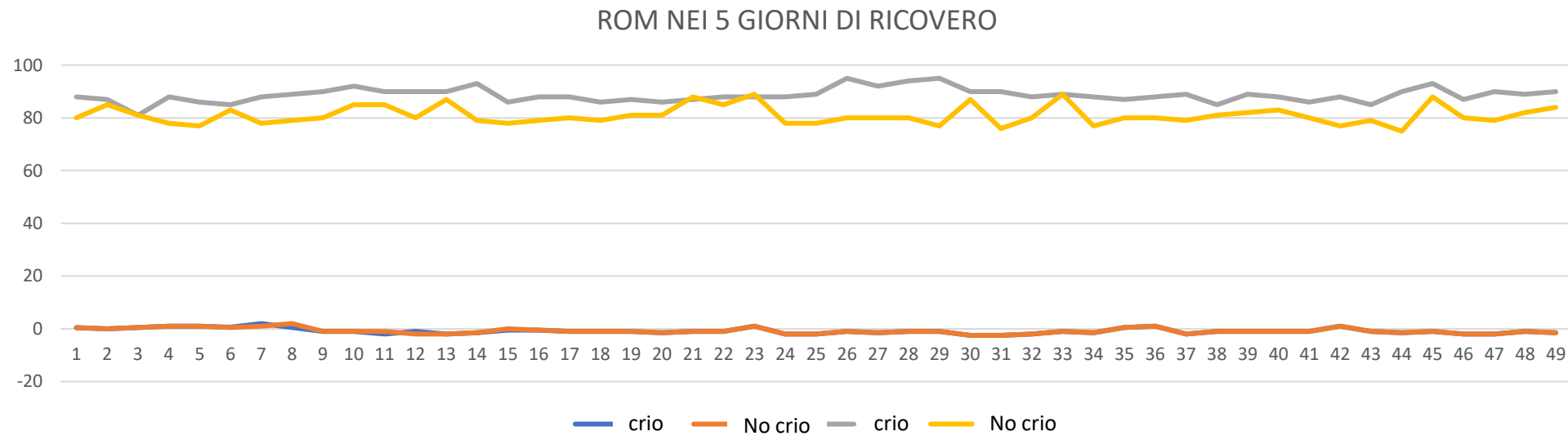
FLESSIONE ATTIVA 1 GG POST OP



FLESSIONE ATTIVA 3 GIORNATA POST OP



FLESSIONE ATTIVA (media)	Crio	No crio
1 giornata	88,6	80,9
3 giornata	91,4	85,7
5 giornata	92,3	90,2





## Nessuna differenza significativa :

- Nell'estensione attiva o passiva
- Nelle perdite ematiche (valori medi di HB in 1, 3 , 5 gg post op)
- Nel tempo di ricovero (tempo medio di ricovero di 5,35 gg in entrambi i gruppi)
- Nessuna infezione
- Nessun evento tromboembolico



**Forza dello studio**

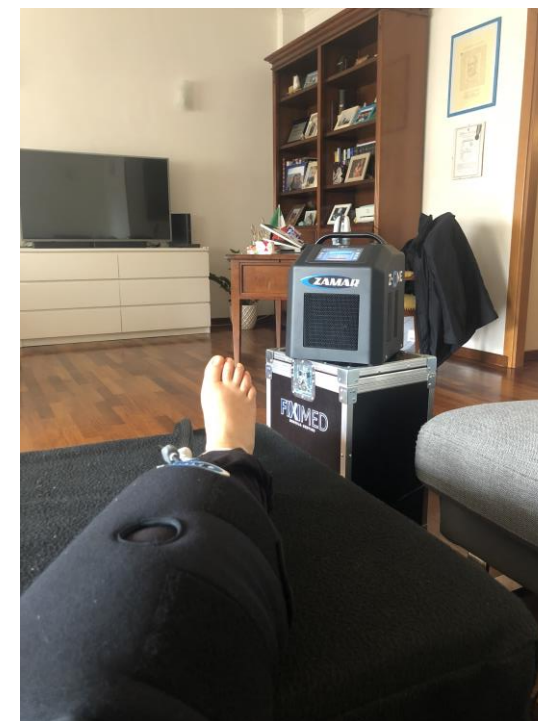


**Debolezze dello studio**



**netta riduzione del dolore  
nel post operatorio, con  
minore utilizzo di  
antidolorifici**

- **Serie limitata di casi**
- **Mancato utilizzo del macchinario dopo la dimissione**
- **Compliance del personale**



# Utilizzo crioterapia computerizzata in Traumatologia

## End point primario

Time to surgery e tempi di ricovero

## End point secondari

1. Infezioni
2. Deiscenza della ferita chirurgica
3. Controllo del dolore (VAS)
4. Soddisfazione del paziente (smile)









# Protocollo crioterapia in traumatologia

- Applicazione crioterapia 6h +6h nelle 24h
- Applicata nel minor tempo utile
- Applicazione nel pre e nel post operatorio
- Fondamentale la compliance di tutto il personale della UOC

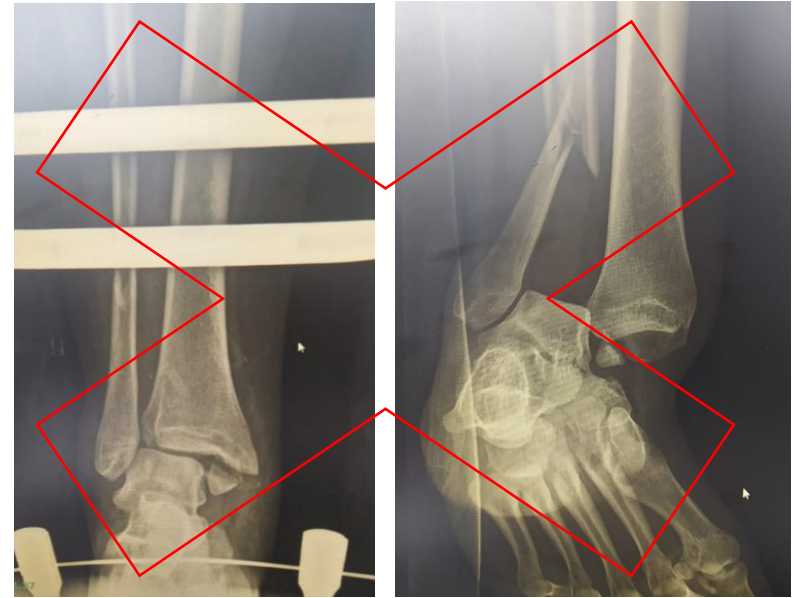


# Studio prospettico

Gennaio 2021 – Settembre 2021

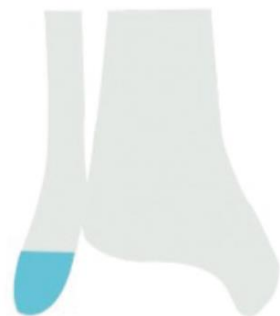
Totale casi : 42

- 29 fratture bi/trimalleolari classificate AO 44 (A,B,C)
- 4 fratture gamba classificate AO 42 (A,B,C)
- 2 fratture del piatto tibiale
- 5 Fratture di rotula
- 2 Fratture calcagno





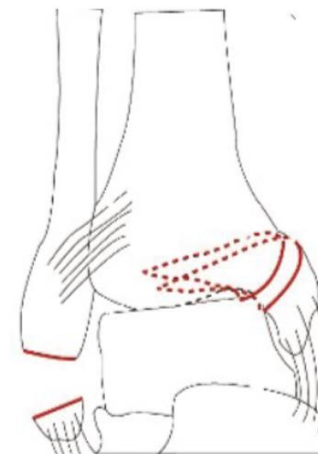
## TIPOLOGIE DI CASI TRATTATI



44 - A1



44 - A2



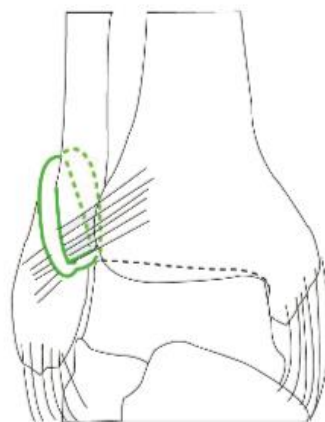
44 - A3

4 CASI - TIPO A1

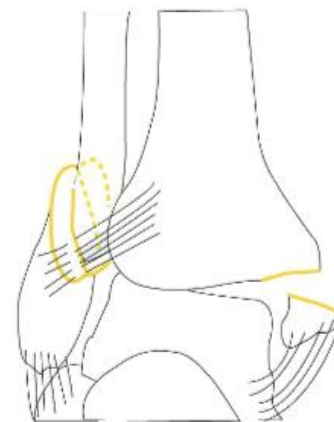
1 CASO - TIPO A2



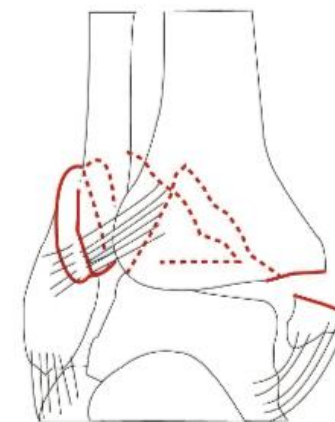
## TIPOLOGIE DI CASI TRATTATI



44 - B1



44 - B2



43 - B3

5 CASI - TIPO B1



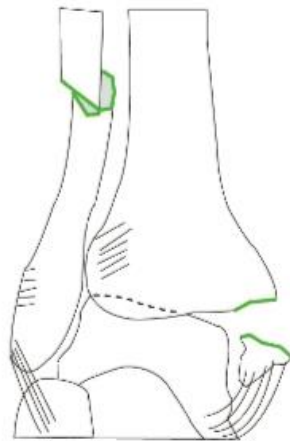
10 CASI - TIPO B2



10 CASI - TIPO B3



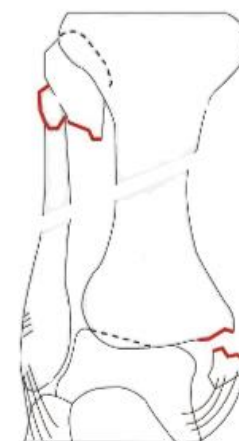
## TIPOLOGIE DI CASI TRATTATI



44 - C1



44 - C2



44 - C3

2 CASI - TIPO C 2



## TIPOLOGIE DI CASI TRATTATI

Herscovici classification for fractures of the medial malleolus

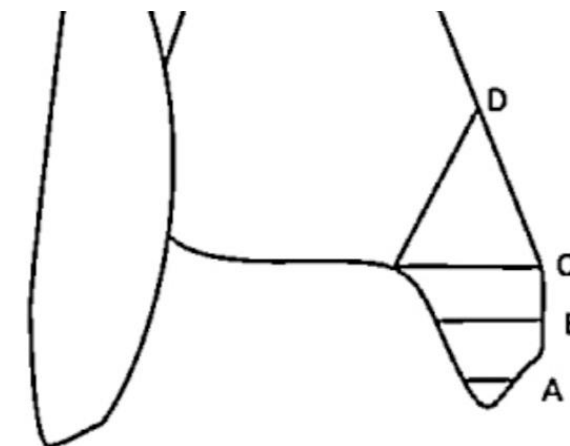
2 CASI



1 TIPO B



1 TIPO C



# TIPOLOGIE DI CASI TRATTATI

## 42 diaphyseal

42-A1



42-A2



42-A3



### 42-A simple fracture

42-A1 spiral

42-A2 oblique ( $\geq 30^\circ$ )

42-A3 transverse ( $< 30^\circ$ )

42-B1



42-B2



42-B3



### 42-B wedge fracture

42-B1 spiral wedge

42-B2 bending wedge

42-B3 fragmented wedge

42-C1



42-C2



42-C3



### 42-C complex fracture

42-C1 spiral

42-C2 segmental

42-C3 irregular

1 CASO A1

2 CASI B1

1 CASO B2



## TIPOLOGIE DI CASI TRATTATI

5 FRATTURE DI ROTULA

2 FRATTURE DI PIATTO TIBIALE

2 FRATTURE DI CALCAGNO



## GRUPPO DI CONTROLLO

- ✓ EPOCA PRE CIO ...
- ✓ FRATTURE TRANSITATE DA APRILE 2018 A GENNAIO 2021
- ✓ PATTERN DI FRATTURA EQUIVALENTE

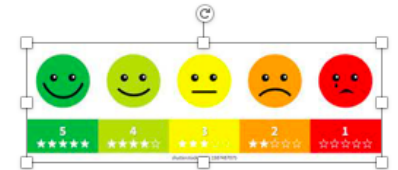


### End point primario

Time to surgery e tempi di ricovero

### End point secondari

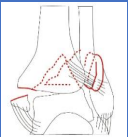
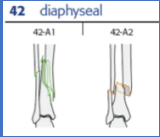






1. Infezioni
2. Deiscenza della ferita chirurgica
3. Controllo del dolore (VAS)
4. Soddisfazione del paziente (smile)



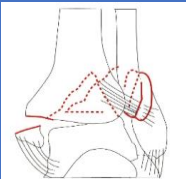
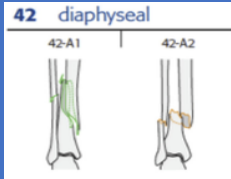






Totale casi : 84 SUDDIVISI IN 2 GRUPPI

	Crio Group	No crio Group
AO 44 A, B,C	29	29
AO 42 A,B,C	4	4
PIATTO TIBIALE	2	2
ROTULA	5	5
CALCAGNO	2	2

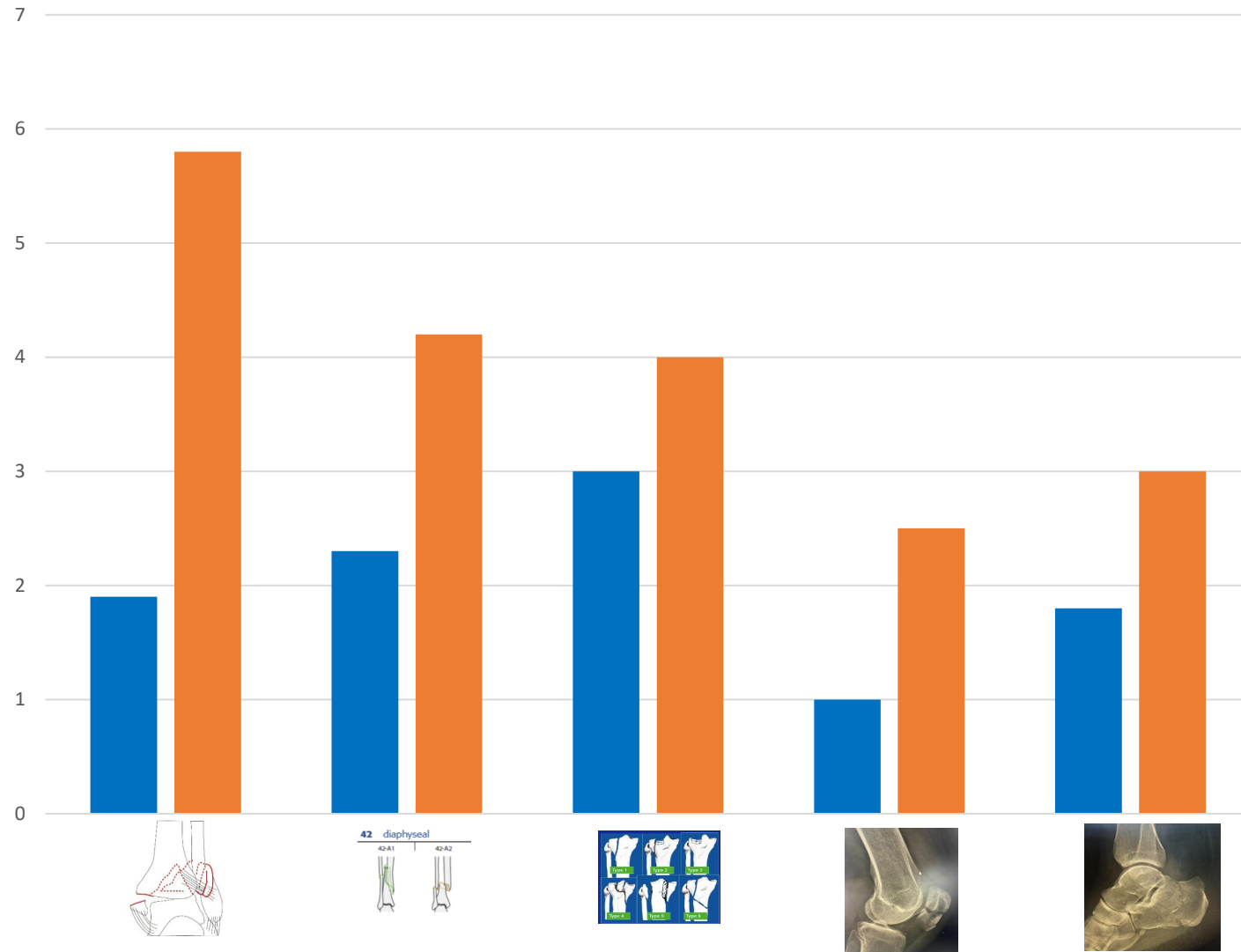
	Crio Group	No crio Group
Età media	55,4 16-80	56 18-82
Sesso	26 F 16 M	29 F 13 M
Lato	20 dx 22 sx	23 dx 19 sx
ASA media	1,9	2

CRIO GROUP				rotula	calcagno
Time to surgery (Media in ore )	40 h	72 h	48 h	26 h	62 h
Deiscenze	0	0	0	0	0
Infezioni	0	0	0	0	0
Vas media	1,9	2,3	3	1	1,8
Soddisfazione del pz					
Giorni di ricovero	3,25 gg	5 gg	5gg	3gg	6 gg

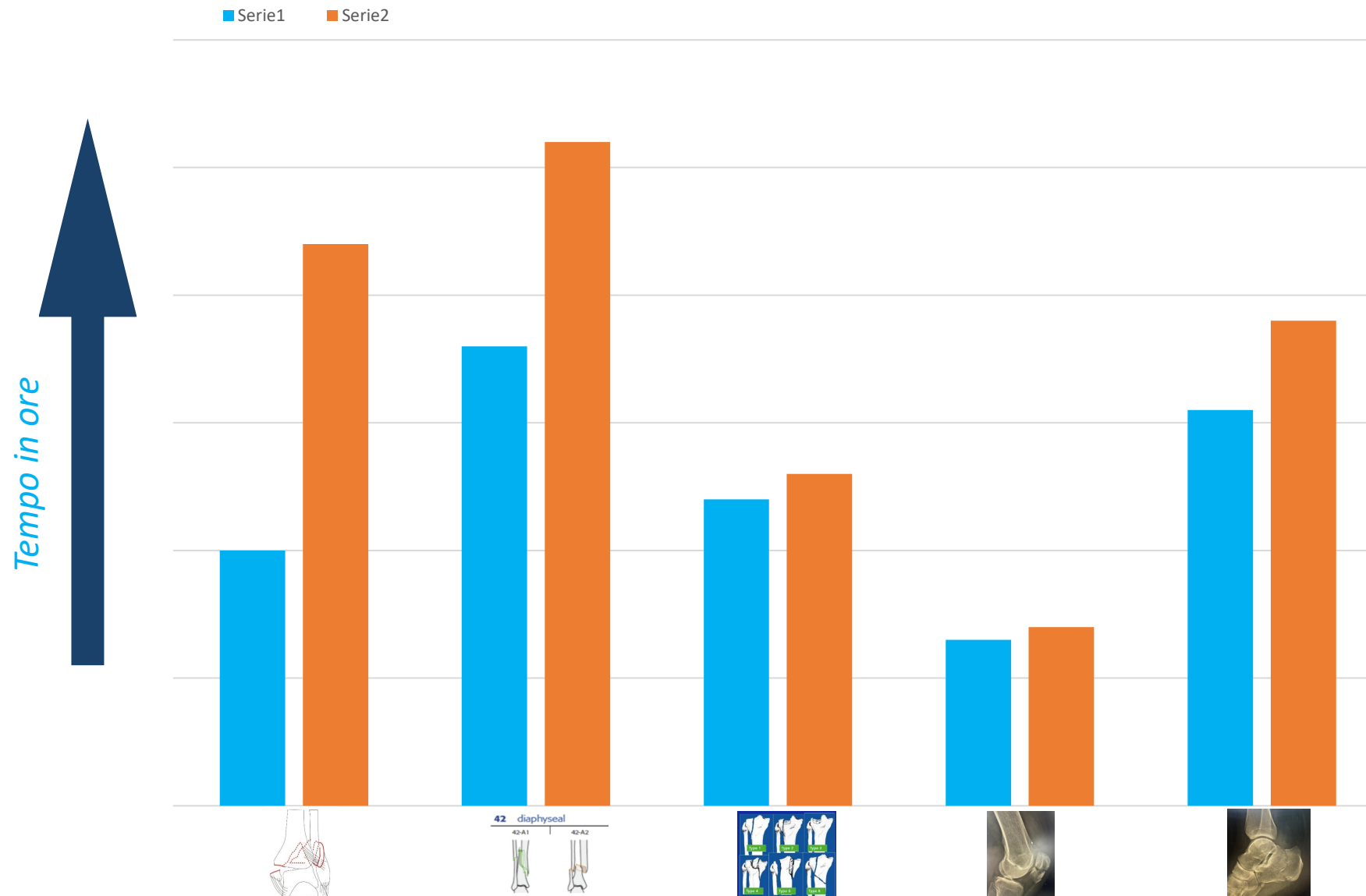


NO CRIO GROUP				rotula	calcagno
Time to surgery (Media in ore )	88 h	104 h	52 h	28 h	76 h
Deiscenze	4	0	1	0	1
Infezioni	1	0	0	0	0
Vas media	5,8	4,2	4	2,5	3
Soddisfazione del pz					
Giorni di ricovero	5 gg	6,25 gg	7 gg	3 gg	8 gg

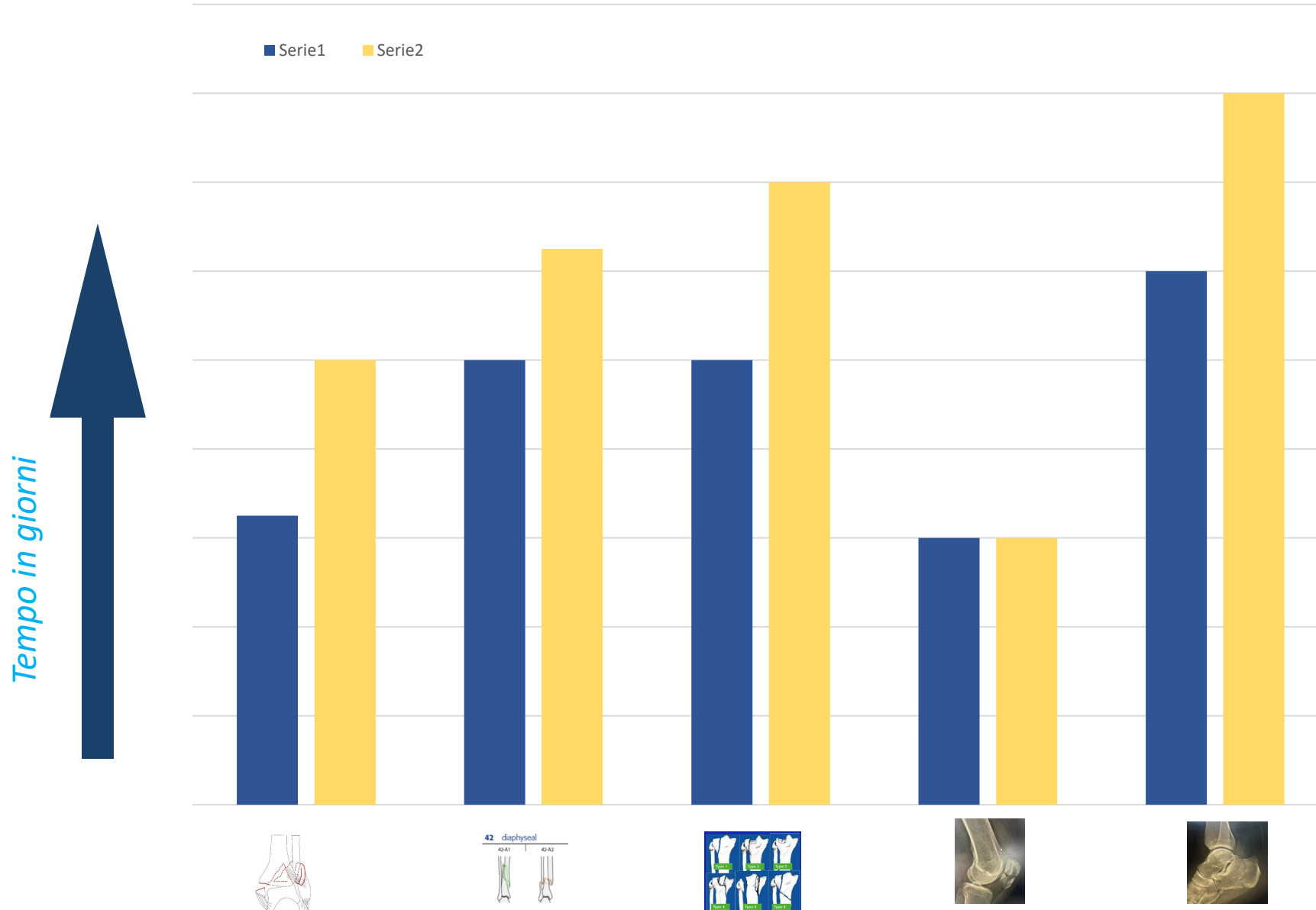
# VAS MEDIA



# TIME TO SURGERY



# DURATA DEL RICOVERO



## Debolezze dello studio

- ✓ Serie di casi limitata
- ✓ FU molto breve
- ✓ Tipologie diverse di fratture con tempi di recupero molto diversi
- ✓ Distretti interessati altrettanto vari

## Forza dello studio

- Riduzione del tempo di attesa medio all'intervento
- Riduzione del dolore durante la degenza
- Riduzione dei giorni di ricovero





## Vantaggi

- ✓ Nessuna reazione locale
- ✓ Nessun intolleranza alla crio
- ✓ Nessuna complicanza connessa alla macchina
  
- ✓ Migliore controllo del dolore
- ✓ Migliore soddisfazione del paziente
- ✓ Miglior recupero funzionale

## Svantaggi

- ✓ Costi?
- ✓ Compliance di tutta la UOC





# In conclusione, nella nostra serie

...

## la Crioterapia computerizzata è:

- ✓ Un presidio sicuro ed efficace nella gestione del dolore acuto post operatorio e nel precoce recupero funzionale
- ✓ Garantisce una migliore soddisfazione del paziente




**AZIENDA USL ROMA 4**  
Via Terme di Traiano 39/A - 00053 Civitavecchia (RM)

Ortopedia e Traumatologia  
Ospedale San Paolo Civitavecchia  
Direttore: Dott. Carmelo D'Arrigo  
VALUTA IL TUO RICOVERO

INIZIALI PAZIENTE	N LETTO
ETA'	PATOLOGIA




SEI SODDISFATTO DEL TUO RICOVERO ?




CONSIGLIERESTI QUESTO REPARTO AD ALTRI ?

SI NO

COME VALUTI LA GESTIONE DEL DOLORE IN QUESTO REPARTO ?

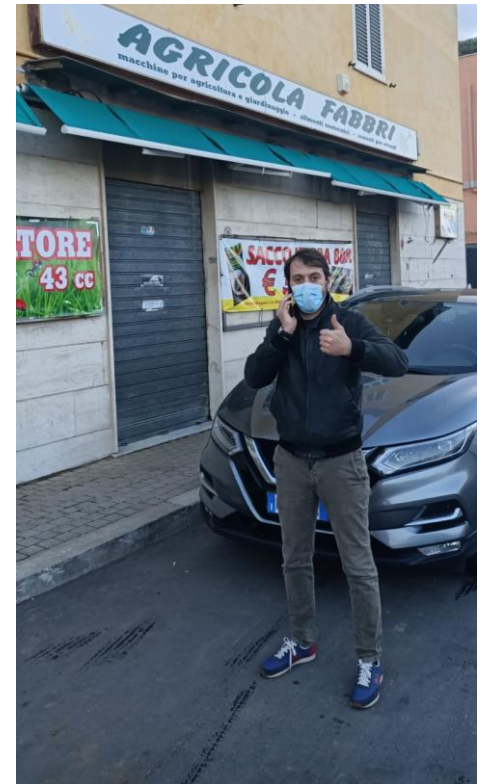
COME VALUTI IL TRATTAMENTO FISIOTERAPICO ?



# ...è un alleato prezioso

- per ridurre i tempi di attesa all'intervento
- per limitare e prevenire l' edema dell'arto
- proteggendo il paziente dal rischio di deiscenze della ferita chirurgica ed eventuali infezioni





# Grazie

