2022-2023

THÈSE

pour le

DIPLÔME D'ÉTAT DE DOCTEUR EN MÉDECINE

Qualification en MEDECINE D'URGENCE

Complication rate comparison between plaster of Paris and fiberglass for patients with lower limb trauma

Comparaison du taux de complications entre immobilisation en plâtre de Paris et en résine chez les patients traumatisés du membre inférieur

DOREZ Simon

Né le 31 juillet 1993 à AMIENS (80)

Sous la direction de Mme le docteur DOUILLET Delphine

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Soutenue publiquement le :
08 septembre 2023

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Admis(e) dans l'intimité des personnes, je tairai les secrets qui me seront confiés. Reçu (e) à l'intérieur des maisons, je respecterai les secrets des foyers et ma conduite ne servira pas à corrompre les mœurs. Je ferai tout pour soulager les souffrances. Je ne prolongerai pas abusivement les agonies. Je ne provoquerai jamais la mort délibérément.

Je préserverai l'indépendance nécessaire à l'accomplissement de ma mission. Je n'entreprendrai rien qui dépasse mes compétences. Je les entretiendrai et les perfectionnerai pour assurer au mieux les services qui me seront demandés.

J'apporterai mon aide à mes confrères ainsi qu'à leurs familles dans l'adversité. Que les hommes et mes confrères m'accordent leur estime si je suis fidèle à mes promesses ; que je sois déshonoré (e) et méprisé(e) si j'y manque ».

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REMERCIEMENTS

A ma directrice de thèse, Madame le **Docteur Delphine DOUILLET**,
Je te remercie de m'avoir proposé ce sujet ainsi que pour ton accompagnement tout au long de ce travail. Sans oublier ton implication au cours dans notre formation et pour ta disponibilité.

A Monsieur le **Professeur Pierre-Marie ROY**,
Je vous remercie de me faire l'honneur de présider mon jury de thèse. Merci d'avoir accepté mon droit au remord en tant que coordonnateur du DES. Et également pour tous les enseignements que vous nous avez apportés au cours de l'internat.

A Monsieur le **Professeur Dominique SAVARY**,
Je te remercie de juger mon travail ainsi que pour les cours que tu nous as dispensés. Je n'oublierai pas les sorties SMUR où on devait t'apprendre quelque chose.

A Monsieur le **Docteur Louis RONY**,
Vous me faites l'honneur de juger mon travail et je vous en remercie.

A Monsieur le **Docteur Richard CHOCRON**,
Vous me faites l'honneur de juger mon travail et je vous en remercie.

A Monsieur le **Docteur Jeremy LELLOUCH**,
Merci à toi d'avoir accepté d'être membre de mon jury. C'est un grand honneur pour moi que tu sois juge de mon travail. Merci pour tout ce que tu nous as transmis au cours de ce semestre au PSSL.

Aux médecins avec qui j'ai eu la chance de travailler au cours de mon internat, des **urgences** du CHU d'ANGERS à la **réanimation** en passant par la **cardiologie** à LAVAL. Sans oublier le **PSSL** et mes praticiens en médecine générale.

A mes co-internes du **Bailleul**, avec qui on a passé un semestre COVID à apprendre à gérer les Optiflow.

A mes co-internes de **Réa**, la bonne ambiance avec les équipes paramédicales nous a fait passer un semestre inoubliable.

A mes co-internes de **cardio**, nos longues pauses le midi, et l'excellent café que je n'allais pas chercher.

A mes co-internes de **médecine d'urgence**, merci pour votre accueil dans la promo.

A mes **parents**,
Pierre-Yves et **Françoise** sans qui je ne serais pas là. Cqfd. Merci pour votre soutien tout au long de mes études et au quotidien.

A mes frères **Mathieu** & **Thomas**, **Judith**, **Sarah**, **Salomé** et **Isaac**,
Merci pour votre présence et votre soutien depuis ma plus tendre enfance. A bientôt sur le green ou sur le bateau. Ps : Je ne vous en veux pas pour les boules de neige au ski.

A **Bon papa**,
Toi qui aurais aimé être là aujourd'hui.

A **Mamie**,
Merci pour ton soutien, et pour les frites quand j'étais petit.

REMERCIEMENTS

A mon parrain **Dominique** et ma marraine **Béatrice** ainsi que le reste de ma **famille**,
Merci pour votre présence et votre soutien

A mes amis Amiénois du lycée, **Axel**, **Guillaume**, **Faustine**, et **Émilie**.

A **Antoine** & **Clément**, depuis le WEI à nos vacances sans oublier notre rituel du jeudi soir : le Bao.
Que de bons souvenirs.

A tous les autres amiénois **Clément & Sylvie**, **Agathe**, **Céline**, **Solène** (et ceux que j'oublie).

A **Pirate**, toi qui nous apportes de la douceur tous les matins et qui a voulu écrire cette thèse en montant sur le clavier.

Et enfin, à **Mathilde**,
Toi qui m'accompagnes et me soutien au quotidien ; Qui m'apporte de l'amour chaque jour,
Encore merci pour la relecture de ce travail.

Abbrevations list

ED	Emergency Departement
VTE	Venous Thromboembolislm
ATE	Average Treatment Effect
SD	Standard Deviation
IQR	Inter quartile Range

Plan

Complication rate comparison between plaster of Paris and fiberglass for patients with lower limb trauma

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ABSTRACT

INTRODUCTION: Lower limb trauma is a common reason for visiting the emergency room. The treatment has evolved through century from Hippocrates to nowadays. Plaster of Paris is in competition with fiberglass since 1970's, but there is no scientific recommendation to choose one of those materials. The aim of this study was to compare the complication rate between plaster of Paris and fiberglass at 90 days after a lower limb trauma.

METHODS: A post hoc study of CASTING trial was performed. It was a stepped-wedge cluster randomized open-label trial with blinded outcome evaluation in 15 emergency departments in France and in Belgium which included patients with lower limb trauma requiring immobilization. Patients were followed-up by phone at 30 days and 90 days. For comparison between the 2 groups, a propensity score adjustment using the average treatment effect (ATE) was performed.

RESULTS: Of the 2120 recruited patients, 869 patients were included: 628 with plaster of Paris and 241 using fiberglass immobilization. The primary outcomes occurred in 6.7% (95%CI; 4.7 to 8.7%) in plaster of Paris group, and in 16.7% (95%CI; 11.9 to 21.4%) in fiberglass group. The odds ratio was 2.8 (95%CI; 1.8 to 4.5%). The difference risk increase was 10.0% (95% CI; 4.9 to 15.1%).

CONCLUSIONS: Fiberglass use in immobilization of lower limb trauma was associated with a 3-fold increase of complications (i.e., wounds, pain, allergy, oedema, or pruritus) at 90 days compare with Plaster of Paris.

TRIAL REGISTRATION: Approval from Angers University Hospital ethical committee on April 7th, 2022 and registered as N°2022-067.

INTRODUCTION

Traumatology is a frequent condition in Emergency Departments (ED). Around 120 thousands of patients were admitted every years for lower limb trauma requiring immobilization in the American EDs.[1] The most common treatment for non-displaced fracture, fracture treated by non-major outpatient surgery and sometimes severe ankle sprains is immobilization in a cast. The materials and techniques used for immobilization are varied, with two main types: plaster of Paris and fibreglass.[2–4]

The first description of immobilization was made by Hippocrates 350BC. He wrapped injured limbs with bandage of wax and resin.[5] Few centuries later, Egyptians used clay, flour and egg white as immobilization material.[6] During the 18th century, Larrey improved this method by a mix of wet linen, camphor alcohol, egg white and lead acetate.[7] Next, a "cast plaster" technique was described, consisting of a wooden frame into which plaster was poured.[5] Seutin, a Belgian surgeon invented another method called "l'appareil amidoné" which consisted of an assembly of linen or bandage with carton splints soaked in starch and all of that wrapped around the limb. The evolution of immobilization were accelerated by all the different wars and resulted injuries. The Dutch surgeon Anthonius Mathijsen, get inspired of Seutin's method and created a technique that consisted of strips of coarse cotton cloth with finely powdered plaster rubbed in. This technique was published it in Repertorium in 1852.[8]
In 1906, Meisenbach sum up 4 essentials keys for plaster of Paris : lightweight, strong, quick set, and breathable.[9] Since 1930, first plaster of Paris bandage as we know today is produced.

However, in the 1970's a new alternative appeared. It was called resin or fiberglass. This material is a fiber polymer made of a plastic matrix reinforced by fine glass. This is a synthetic

cast which is lighter and stronger than plaster of Paris described as less moldable and more expensive.[10,11] Another strength is that fiberglass has a higher resistance to water.[12]

Immobilization can cause various complications. The most feared is pressure sore and compartment syndrome.[2] To avoid those serious complications during lower limb immobilization, explanations are given to the patient.[13,14] A less serious consequence is cast damaged often due to bad reinforcement or bad usage like foot support on it.[3,15,16]

Despite the frequent use of plaster of Paris or fiberglass for immobilization, few studies have been carried out to assess secondary complications.[17] Consequently, no recommendation is available to help physician to choose wisely the best treatment.[18,19] Therefore, practices are different from a hospital to another, and depending on the practitioner's habits.

1. Aim Of The Study

The aim of this study was to compare the complication rate between plaster of Paris and fiberglass at 90 days after a lower limb trauma.

METHODS

1. Trial Design

A post-hoc analysis of CASTING study was performed.[20] This trial was a unblinded, non-inferiority, stepped-wedge cluster randomized clinical trial that was conducted in 15 hospitals in France and in Belgium.[21] The aim of this study was to assesses in patients with lower limb trauma requiring orthopaedic immobilization and admitted to the ED, the safety of withholding prophylactic anticoagulation for patients at low-risk of venous thromboembolism (VTE) based on the TRiP(cast) score with regards to the 3-month rate of symptomatic VTE.[20] The study was sponsored by the French Health government that had no role in the design or conduct of the trial, collection and analysis of the data, or preparation of the manuscript.

2. Trial population

Patients who were included in the trial were over 18 years old and had a lower limb trauma requiring rigid or semi-rigid immobilization for an anticipated duration of at least 7 days. Patients regularly treated by anticoagulation at time of trauma, or whose trauma required surgery or hospitalization for more than 2 days at time of inclusion, or any comorbidity requiring hospitalization at time of inclusion, or any factor that makes 90-day follow-up impossible or patient under legal protection measures or detainee status were not included in this trial. All participants provided written informed consent. Only patients treated with plaster of Paris or fiberglass were included in the post-hoc analysis.

3. Data Collection Method

Data concerning the type of trauma and immobilization were collected at inclusion. This included: type of trauma, immobilization techniques and equipment used. A standardized phone follow-up was performed at 30 days and at 90 days after trauma. All complications due to immobilization were collected, i.e., wound, allergy, compression, pruritus, cast damaged or other complications. Quality of life was measured with the EQ5D score (supplementary appendix 1). It assesses mobility, autonomy, activity, pain, discomfort, anxiety, or depression. Patients were asked if they resume professional or sport activity considered as normal for them and if they feel instability during walk.

4. Outcomes

The primary aim was to compare the complication rate between the two techniques: plaster of Paris versus fiberglass. This endpoint includes wounds, pain due to immobilization, allergy, oedema, pruritus but excludes cast damaged and loose plaster. This endpoint was collected prospectively from each patient during a telephone interview at D30 and D90. Secondary objectives were to compare all types of complications between plaster of Paris and fiberglass at 90 days. Sensitivity analysis was performed to compare the complication rate at 30 days with the same endpoint as the primary objective. Moreover, professional and sport activity resumption were compared at 90 days between the two groups; And the residual instability was assessed at 90 days according to the type of immobilization.

A subgroup analysis compared complication at 90 days between univalving split cast and circular cast.

VTE rate event was compared between the two groups and in the overall raw population.

5. Statistical Analysis

For descriptive analyses, quantitative variables were reported as mean ± standard deviation (SD) when their distribution can be considered as Gaussian, and with median and inter quartile ranges (IQR) otherwise. Qualitative variables were reported using numbers and proportions. Comparisons were performed using Student or Mann-Whitney tests for quantitative variables and using the Fisher Exact test for qualitative variables.

Weighting-based propensity score was performed using average treatment effect (ATE) for comparison between plaster of Paris group and fiberglass group. Patients were balanced using age, sex, BMI, and severity of the trauma. Once patient profiles has been balanced, a logistic regression was performed. Then, the complication rate between each group on primary and seconds outcomes was compared. Odds ratio with 95% confidence intervals (95%CI) were reported. The absolute risk difference between the 2 groups was computed. $P<0.05$ was considered as statistically significant. No imputation of missing data was performed. Statistical analyses were performed using R software (version 4.0.3; , R-Core Team).

6. Ethical Consideration

This study obtained the approval from Angers University Hospital ethical committee on April 7th 2022 and registered as N°2022-067. CASTING trial was approved by an ethic committee in France (ID-RCB:2019-A01829) and in Belgium (N°B403201941338).

RESULTS

1. Study Population

From June 2020 through September 2021, a total of 15 EDs participated in the trial and 2120 patients were enrolled. Three patients were excluded because they had not met the inclusion criteria or had met exclusion criteria, 162 withdrew consent, 1017 were immobilize by other method and 12 excluded by a lack of data. A total of 926 patients were included: 666 in plaster of Paris group and 260 patients in fiberglass group. 628 of the 666 patients were analyzed in the plaster of Paris group, 35 were lost to follow-up and 3 withdrew consent. 241 of the 260 patients were analyzed in fiberglass group, 18 were lost to follow-up and 1 withdrew consent (figure 1). Patient's characteristics were similar between the two groups (table 1); 50.6% were women, and the median (IQR) age of participants was 40.5 (26-52) years old. The more frequent injury was metatarsal bone or forefoot fracture in both group (33.6% in plaster of Paris group and 29.0% in fiberglass group). The most prescribed immobilization was lower leg cast boot (89% in plaster of Paris group and 90.5% in fiberglass group) (table 2).

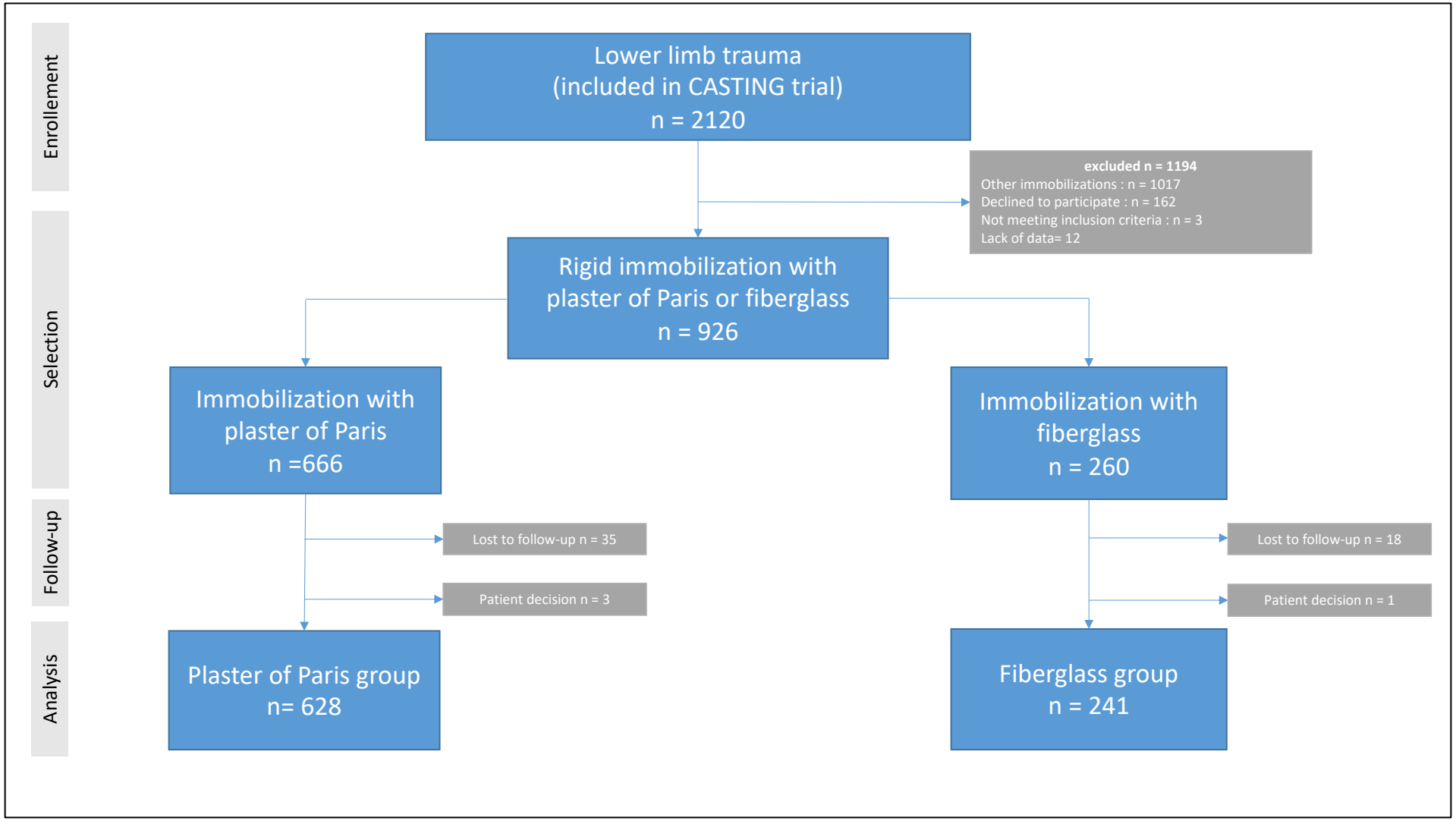


Figure 1. Flow chart

Table 1. Baseline characteristic of patients		
	Plaster of Paris n=628 (%)	Fiberglass n=241 (%)
Age – years, mean (IQR)	40.7 (26-52)	40.2 (24-54)
Sex — No. (%)		
Women	328 (52.2)	112 (46.5)
Men	300 (47.8)	129 (53.5)
Body Mass Index	24.9 (21.8-27.2)	25.1 (22.3-26.9)
Obesity (BMI > 30kg/m^2) — No. (%)	75 (11.9)	35 (14.5)
Comorbidities — No. (%)		
Personal history of venous thromboembolism	13 (2.1)	5 (2.1)
History of venous thromboembolism in first-degree	52 (8.3)	19 (7.9)
Contraceptive use or estrogenic hormone therapy	67 (10.7)	21 (8.7)
Active cancer within the past 5 years	9 (1.4)	4 (1.7)
Post-partum	2 (0.3)	0 (0)
Immobilization within the past 3 months	1 (0.2)	1 (0.4)
Surgery within the past 3 months	4 (0.6)	0 (0)
Chronic cardiac failure	2 (0.3)	0 (0)
Rheumatoid arthritis	4 (0.6)	3 (1.2)
Chronic renal failure	0 (0)	0 (0)
Chronic Obstructive Pulmonary Disease	3 (0.5)	1 (0.4)
Inflammatory bowel disease	3 (0.5)	0 (0)
Chronic venous insufficiency	43 (6.8)	23 (9.5)
Personal history of superficial venous thromboembolism	7 (1.1)	2 (0.8)
Tobacco	170 (27.1)	84 (34.9)
Diabetes	19 (3.0)	7 (2.9)

Table 2. Trauma and immobilization characteristics		
	Plaster of Paris n=628 (%)	Fiberglass n=241 (%)
Type of trauma – No. (%)		
Fibula and/or tibia shaft fracture	53 (8.4)	31 (12.9)
Tibial plateau fracture	6 (1)	2 (0.8)
Achilles' tendon rupture	25 (4)	12 (5)
Bi or tri-malleolar ankle fracture	11 (1.8)	3 (1.2)
Patellar fracture	3 (0.5)	2 (0.8)
Ankle dislocation / Lisfranc injury	51 (8.1)	14 (5.8)
Severe knee sprain	1 (0.2)	0 (0)
Severe ankle sprain	159 (25.3)	68 (28.2)
Fracture d'une malléole de la cheville	100 (15.9)	30 (12.4)
Patellar dislocation	2 (0.3)	0 (0)
(Meta)tarsal bone(s) or forefoot fracture	211 (33.6)	70 (29)
Non-severe ankle or knee sprain (grade 2)	34 (5.4)	9 (3.7)
Non-severe ankle or knee sprain (grade 1)	7 (1.1)	3 (1.2)
Significant muscle injury	6 (1)	3 (1.2)
Other trauma	3 (0.5)	0 (0)
Type of imobilization – No. (%)		
Upper leg cast	28 (4.5)	7 (2.9)
Lower leg cast	559 (89)	218 (90.5)
Foot cast (ankle free) or any semi-rigid without plantar support	40 (6.4)	12 (5)
Other cast or bracing with plantar support	1 (0.2)	4 (1.7)
Plantar support – No. (%)		
Forbidden	608 (96.8)	221 (91.7)
Partial	13 (2.1)	12 (5)
Permitted	7 (1.1)	8 (3.3)

2. Primary Outcome

Complication rate in plaster of Paris group was 6.7% (95%CI 4.7 to 8.7) and 16.7% (95%CI 11.9 to 21.4) in the fiberglass group (p <0.001). The odds ratio was 2.8 (1.8 to 4.5) for plaster of Paris (figure 2). The difference risk was in favor of plaster of Paris with 10.0% (95%CI 4.9 to 15.1). Sixty-five complications were reported out of 121 in Plaster of Paris group whereas 19 were reported out of 29 in fiberglass group (table 3).

3. Secondary Outcomes

Considering all complications at 90 days, the complication rate was 8.8% (95%CI 6.6 to 11.0) in plaster of Paris group and 20.8% (95%CI 15.6 to 26.0) in fiberglass group (p< 0.001). The odds ratio was 2.7 (95%CI 1.8 to 4.1) and the difference risk was 12.0% (95%CI 6.4 to 17.6) (figure 2). One hundred patients in plaster of Paris group reported at least one complication whereas 25 in fiberglass group.

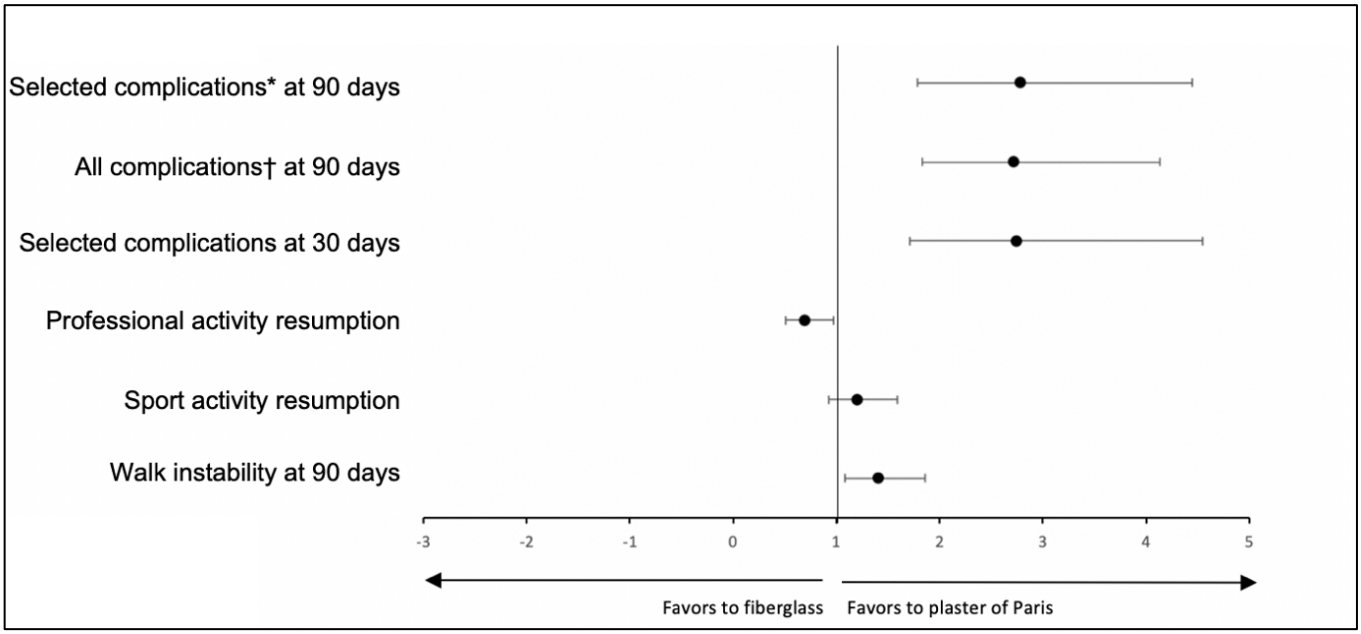
At day 30, comparing the two groups using the complication criterion, as defined in the primary outcome, the complication rate was 5.7% (95%CI 3.9 to 7.6) among the plaster of Paris group and 14.4% (95%CI 9.9 to 18.8) in the fiberglass group. The odds ratio was 2.8 (95%CI 1.7 to 4.6) and the risk difference was 8.6% (95%CI 3.8 to 13.4). Those results were statistically significant (p<0.001). Hundred and eight complications were reported out of 202 in Plaster of Paris group whereas 59 were reported out of 89 in fiberglass group.

Professional resumption of activity at 90 days was 80.5% in the plaster of Paris group (95%CI 77.4 to 83.6) while 74.4% (95%CI 68.8 to 79.9) in fiberglass group. The odds ratio was 0.7 (95%CI 0.5 to 0.97) with a risk difference of 6.1% (95%CI 0.2 to 12.5). Three hundred and sixteen out of 436 patients resumed work activity in plaster of Paris group compare with 117 out of 178 in fiberglass group. Concerning sport resumption at 90 days results were non-significant with 44.2% (95%CI 40.3 to 48.0) of resumption in the plaster of Paris group compared with 48.9% (95%CI 42.6 to 55.3) in the fiberglass group. The odds ratio was of 1.2 (95%CI 0.9 to 1.6).

Considering instability feeling at 90 days, 36.7% (95%CI 32.9 to 40.4) feeling of instability was reported in plaster of Paris group and 45.0% (95%CI 38.7 to 51.3) in fiberglass group. The odds ratio was 1.4 (95%CI 1.1 to 1.9). Two hundred and twenty-five out of six hundred and twenty-eight patients in plaster of Paris group reported instability than 107/241 in fiberglass group.

Univalving split cast was associated with a complication rate of 32.9% (95%CI 21.9 to 43.9) while circular cast showed a rate of 5.7% (95%CI 3.8 to 7.7). The odds ratio was 16.5 (95%CI 8.6 to 35.6) and the risk difference was 30.0% (95%CI 18.8 to 41.1) (table 3).

In the overall raw population, the venous thromboembolism (VTE) rate at 3 months was 1.96% (95%CI 1.2 to 3.1) (n=18/926). Among them, 1.8% (95%CI 1.0 to 3.1; n=12/666) were treated with a plaster of Paris and 2.3% (95%CI 1.1 to 4.9; n=6/260) treated with a fiberglass cast.



*Selected complications: wounds, pain due to immobilization, allergy, oedema, pruritus

† All complications: wounds, pain due to immobilization, allergy, oedema, pruritus, cast damaged and loose plaster

Figure 2. Forrest Plot

Table 3. Primary and Secondary outcomes			
Outcomes	**Plaster of Paris n=628 (72.3%)**	**Fiberglass n=241 (27.7%)**	**Risk difference % (95%CI)**
Primary outcome			
Selected complications* at 90 days - no of complications/no of all reported complications (percentage of selected complications)	65/121 (9.7)	19/29 (12.7)	10.0 (4.9 to 15.1)
Percentage point after propensity score adjustement (95%CI)	6.7% (4.7 to 8.7)	16.7% (11.9 to 21.4)	
Secondary outcomes			
All complications† **at 90 days** - no of patients/no of all reported complications (percentage of all complications)	100/121 (19.3)	25/29 (12)	12.0 (6.4 to 17.6)
Percentage point after propensity score adjustement (95%CI)	8.8% (6.6 to 11.0)	20.80% (15.6 to 26.0)	
Selected complications* at 30 days - no of complications/ no of all reported complications (percentage of selected complications)	108/202 (17.2)	59/89 (24.5)	8.6 (3.8 to 13.4)
Percentage point after propensity score adjustement (95%CI)	5.7% (3.9 to 7.6)	14.4% (9.9 to 18.8)	
Professional activity resumption - no/no of workers (percentage of professional activity resumption)	316/436 (72.5)	117/178 (65.7%)	6.1 (0.2 to 12.5)
Percentage point after propensity score adjustement (95%CI)	80.5% (77.4 to 83.6)	74.4% (95%CI 68.8 to 79.9)	
Sport activity resumption - no/no of sportsman (percentage of sport activity resumption)	166/509 (32.6)	63/184 (34.2)	4.8 (2.7 to 12.2)
Percentage point after propensity score adjustement (95%CI)	44.2% (40.3 to 48.0)	48.9% (95%CI 42.6 to 55.3)	
Walk instability at 90 days – no (%)	225 (35.8)	107 (44.4%)	8.4 (0.98 to 15.7)
Percentage point after propensity score adjustement (95%CI)	36.7% (32.9 to 40.4)	45.0% (38.7 to 51.3)	

* Selected complications: wounds, pain due to immobilization, allergy, oedema, pruritus
† All complications: wounds, pain due to immobilization, allergy, oedema, pruritus, cast damaged and loose plaster

DISCUSSION

In this post-hoc analysis, the use of fiberglass increased complications by a factor of 3 compared with plaster of Paris looking on wounds, pain, allergy, oedema or pruritus. So that mean plaster of Paris is associated with fewer complications at 90 days after a lower limb immobilization than fiberglass. There was a risk difference of 10.0 %. One complication can be avoiding every 10 cast by using plaster of Paris.

Considering the previous complications at 30 days and all complications at 90 days, results are consistent with the previous one. In fact, a 2.8-fold increase of complication was noticed in fiberglass group at 30 days and 2.7-fold at 90 days. The risk difference was also significant with respectively 8.6% and 12.0%. Plaster of Paris was associated with statistically significant faster resumption of professional activity. The difference rate was 6% between plaster of Paris (80.5%) versus fiberglass (74.4%). But looking on sport activity resumption no difference was shown.

Furthermore, considering the instability reported feeling at 90 days, there was less in plaster of Paris group with a rate of 36.7% compared to 45.0% in fiberglass group.

Looking at local distinctiveness, a 16.5-fold increase of complication was noticed when univalving split cast was performed compared with circular cast. Which was a major surprise because it was performed to avoid potential compartment syndrome complication or pressure sore. This wasn't in accordance with Zaino et al. study which demonstrated that single cut reduced intracast pressure but only triple cut eliminated skin surface pressure.[22]

The main strengths of this study are that these results are consistent between each other and in favor of plaster of Paris. There were less complications at 30 days and 90 days in plaster of Paris group. This is probably due to the mechanical properties of fiberglass. In fact, Chaudhury

et al. and Marson et Keenan proved that fiberglass was associated with higher intracast pressure, that can conduct to complications.[23,24]

Moreover, professional activity resumption was faster in plaster of Paris group which can lead to reduce the sickness leave cost and health expenditures.

Another strength was that this study included many patients. To our knowledge, this is the first time complications of those materials were compared in adult population.[4] Indeed, no study was performed before to evaluate if it's better in term of complications between plaster of Paris and fiberglass in adult population. Inglis et al. did a study in pediatric population and the satisfaction were superior using synthetic cast but the main reported complication in plaster of Paris group was due to breakage.[17]

Some limitations must be discussed. Firstly, our study was a post-hoc analysis. Our results should be confirmed by a randomized controlled trial. Secondly, the complications were based on the feeling of patient so that can induce a reporting bias. Indeed, the feeling of a complication can be different from a patient to another. As well data were collected by phone and can vary. Thirdly, a limitation of our study was that fiberglass is less used than plaster of Paris. So practitioners were less used to this, and less used to the fact that there is a faster drying time with fiberglass. Finally, another limitation was that in French EDs most of cast are done by young medicine resident with limited experience in those technique and as Halanski and Noonan said experience was important to reduce morbidity.[25]

Next steps could screen and compare the material cost and health insurance cost during lower limb immobilization. Another important subject is the impact on environment. Plaster and fiberglass aren't recyclable. Actually, we don't care about material lifecycle, but it will be a

major subject in the future. Woodcast immobilization can be a matter of research and may be an interesting biodegradable casting material.[26,27] Furthermore, it can be interesting to compare those classical type of immobilization with new method. Some studies focus on 3D printing cast which emerges but it is still expansive and with a long printing time.[28–31]

CONCLUSIONS

Fiberglass use in immobilization of lower limb trauma was associated with a 3-fold increase of complications compared to plaster of Paris considering wounds, pain, allergy, oedema or pruritus at 90 days.

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LIST OF FIGURES

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SUPPLEMENTARY APPENDIX

Supplementary Appendix 1. EQ-5D-5L (version française).

Pour chaque rubrique, veuillez cocher UNE case, celle qui décrit le mieux votre santé AUJOURD'HUI.

MOBILITÉ

- Je n'ai aucun problème pour me déplacer à pied ❑
- J'ai des problèmes légers pour me déplacer à pied ❑
- J'ai des problèmes modérés pour me déplacer à pied ❑
- J'ai des problèmes sévères pour me déplacer à pied ❑
- Je suis incapable de me déplacer à pied ❑

AUTONOMIE DE LA PERSONNE

- Je n'ai aucun problème pour me laver ou m'habiller tout(e) seul(e) ❑
- J'ai des problèmes légers pour me laver ou m'habiller tout(e) seul(e) ❑
- J'ai des problèmes modérés pour me laver ou m'habiller tout(e) seul(e) ❑
- J'ai des problèmes sévères pour me laver ou m'habiller tout(e) seul(e) ❑
- Je suis incapable de me laver ou de m'habiller tout(e) seul(e) ❑

ACTIVITÉS COURANTES *(p. ex., travail, études, travaux domestiques, activités familiales ou loisirs)*

- Je n'ai aucun problème pour accomplir mes activités courantes ❑
- J'ai des problèmes légers pour accomplir mes activités courantes ❑
- J'ai des problèmes modérés pour accomplir mes activités courantes ❑
- J'ai des problèmes sévères pour accomplir mes activités courantes ❑
- Je suis incapable d'accomplir mes activités courantes ❑

DOULEURS / GÊNE

- Je n'ai ni douleur ni gêne ❑
- J'ai des douleurs ou une gêne légère(s) ❑
- J'ai des douleurs ou une gêne modérée(s) ❑
- J'ai des douleurs ou une gêne sévère(s) ❑
- J'ai des douleurs ou une gêne extrême(s) ❑

ANXIÉTÉ / DÉPRESSION

- Je ne suis ni anxieux(se) ni déprimé(e) ❑
- Je suis légèrement anxieux(se) ou déprimé(e) ❑
- Je suis modérément anxieux(se) ou déprimé(e) ❑
- Je suis sévèrement anxieux(se) ou déprimé(e) ❑
- Je suis extrêmement anxieux(se) ou déprimé(e) ❑

DOREZ Simon

Comparaison du taux de complication entre immobilisation en plâtre de Paris et en résine chez les patients traumatisés du membre inférieur

RÉSUMÉ

INTRODUCTION: Les traumatismes des membres inférieurs sont un motif de recours fréquent aux urgences. Le traitement a évolué au fil des siècles depuis Hippocrate jusqu'à nos jours. Le plâtre de Paris est en concurrence avec la résine depuis les années 1970, néanmoins il n'existe aucune recommandation scientifique afin de choisir l'un ou l'autre de ces matériaux. Le but de notre étude est de comparer le taux de complication entre le plâtre de Paris et la résine à 90 jours d'un traumatisme d'un membre inférieur.

METHODES: Nous avons réalisé une étude post-hoc de l'étude CASTING. C'est un essai randomisé en ouvert réalisé en permutation séquentielle avec une évaluation en aveugle des résultats. Il s'est déroulé sur 15 services de médecine d'urgence en France et en Belgique incluant des patients avec un traumatisme du membre inférieur qui nécessitait une immobilisation. Les patients étaient suivis par un questionnaire téléphonique standard à 30 jours et 90 jours. Pour la comparaison entre les deux groupes nous avons calculé un score de propension en utilisant l'effet moyen du traitement (ATE).

RESULTATS: Sur les 2120 patients sélectionnés, 869 ont été inclus : 628 dans le groupe plâtre de Paris et 241 dans le groupe résine. Le critère de jugement principal était survenu 6.7% (95%CI; 4.7 à 8.7%) dans le groupe plâtre de Paris et 16.7% (95%CI; 11.9 à 21.4%) dans le groupe résine. L'odds ratio était de 2.8 (95%CI; 1.8 à 4.5%). L'augmentation du risque absolu était de 10.0% (95% CI; 4.9 à 15.1%).

CONCLUSION: L'utilisation de résine dans le cadre d'immobilisation du membre inférieur est associé à une augmentation par un facteur 3 du risque de complications (blessure, douleur, allergie, œdème ou prurit) à 90 jours par rapport à une immobilisation en plâtre de Paris.

Mots-clés : Médecine d'urgence, Traumatologie, Immobilisation, Plâtre de Paris, Résine

Complication rate comparison between plaster of Paris and fiberglass for patients with lower limb trauma

ABSTRACT

INTRODUCTION: Lower limb trauma is a common reason for visiting the emergency room. The treatment has evolved through century from Hippocrates to nowadays. Plaster of Paris is in competition with fiberglass since 1970's, but there is no scientific recommendation to choose one of those materials. The aim of this study was to compare the complication rate between plaster of Paris and fiberglass at 90 days after a lower limb trauma.

METHODS: A post hoc study of CASTING trial was performed. It was a stepped-wedge cluster randomized open-label trial with blinded outcome evaluation in 15 emergency departments in France and in Belgium which included patients with lower limb trauma requiring immobilization. Patients were followed-up by phone at 30 days and 90 days. For comparison between the two groups, a propensity score adjustment using the average treatment effect (ATE) was performed.

RESULTS: Of the 2120 recruited patients, 869 patients were included: 628 with plaster of Paris and 241 using fiberglass immobilization. The primary outcomes occurred in 6.7% (95%CI; 4.7 to 8.7%) in plaster of Paris group, and in 16.7% (95%CI; 11.9 to 21.4%) in fiberglass group. The odds ratio was 2.8 (95%CI; 1.8 to 4.5%). The difference risk increase was 10.0% (95% CI; 4.9 to 15.1%).

CONCLUSIONS: Fiberglass use in immobilization of lower limb trauma was associated with a 3-fold increase of complications (i.e., wounds, pain, allergy, oedema, or pruritus) at 90 days compare with Plaster of Paris.

Keywords : Emergency, Traumatology, Immobilization, Plaster of Paris, Fiberglass

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