



Low intensity pulsed ultrasound [LIPUS] for delayed unions and non-unions after elective foot and ankle procedures

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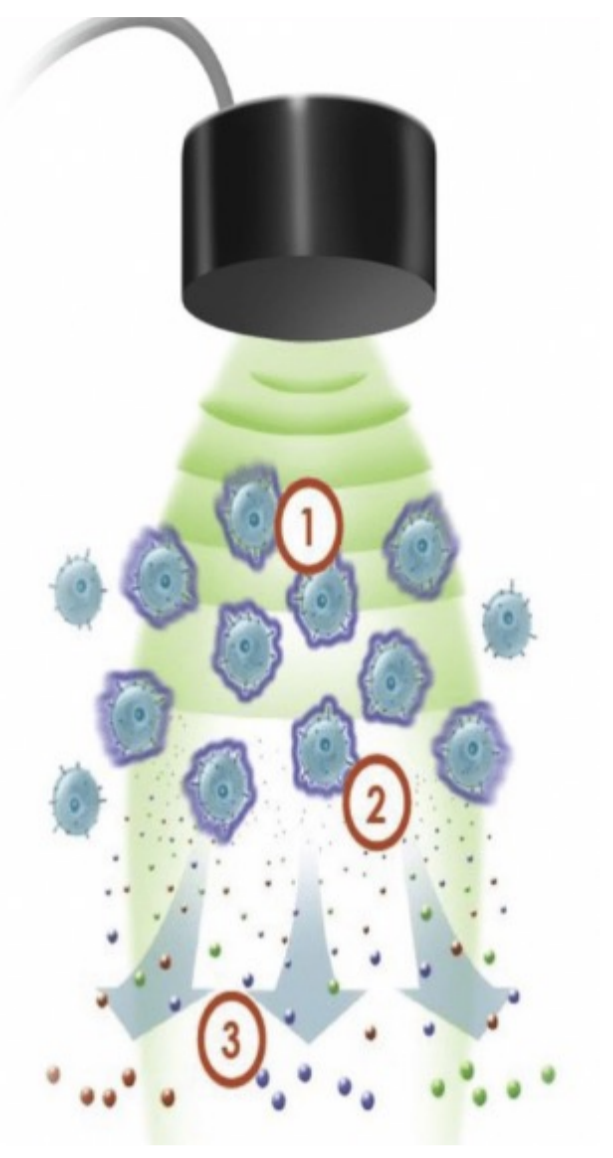
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INTRODUCTION

Non-unions is defined as no evidence of healing > 6 months after the index procedure and delayed unions is defined as no union > 3 months after procedure; are recognised complications of elective foot and ankle surgery. The quoted figures range from 34% for forefoot surgery¹ to 3-11% for ankle arthrodesis². This results in increased pain and poor functional outcomes.

LIPUS has been found to be useful in delayed unions and non-unions following fractures. The ultrasound waves trigger nano-motion of the integrins on the cell surface. This stimulates chondrocyte and osteoblast production, to enable callus formation, and VEGF to promote angiogenesis. Increased prostaglandin synthesis also aids healing.

NICE guidelines recommend LIPUS to treat non-unions of long bone fractures, greater than 9 months and shows estimated savings of £2407 per patient in avoided surgery³. However, there are no guidelines for after elective foot and ankle surgery.

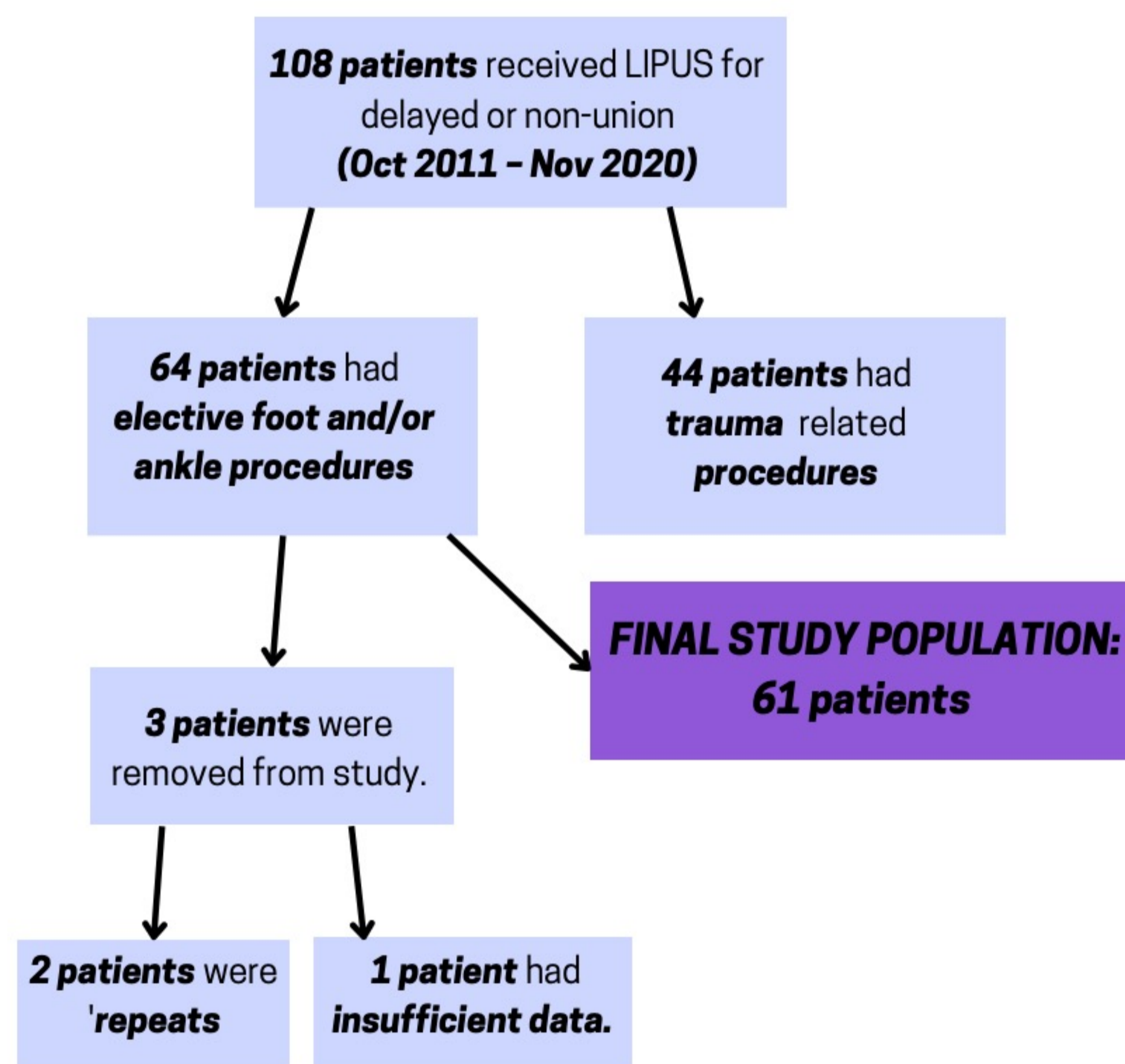


AIM

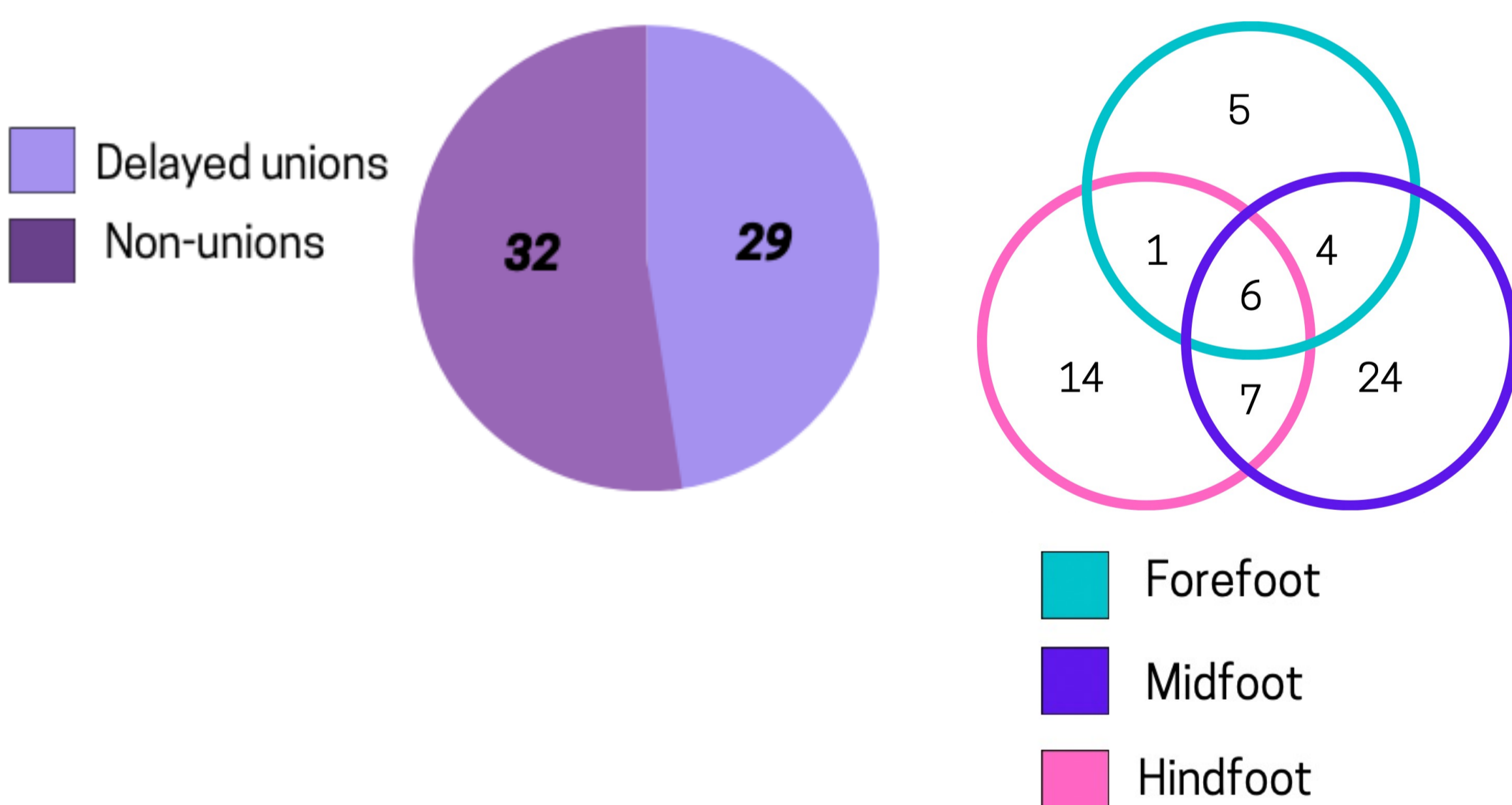
The aim of our study was to assess the effectiveness of LIPUS for delayed and non-unions following elective foot and ankle surgery.

METHODS

Patients who received LIPUS {EXOGEN™ Smith and Nephew} therapy for delayed/non-unions were identified from the Royal Liverpool and Broadgreen Hospitals Trust NHS database.



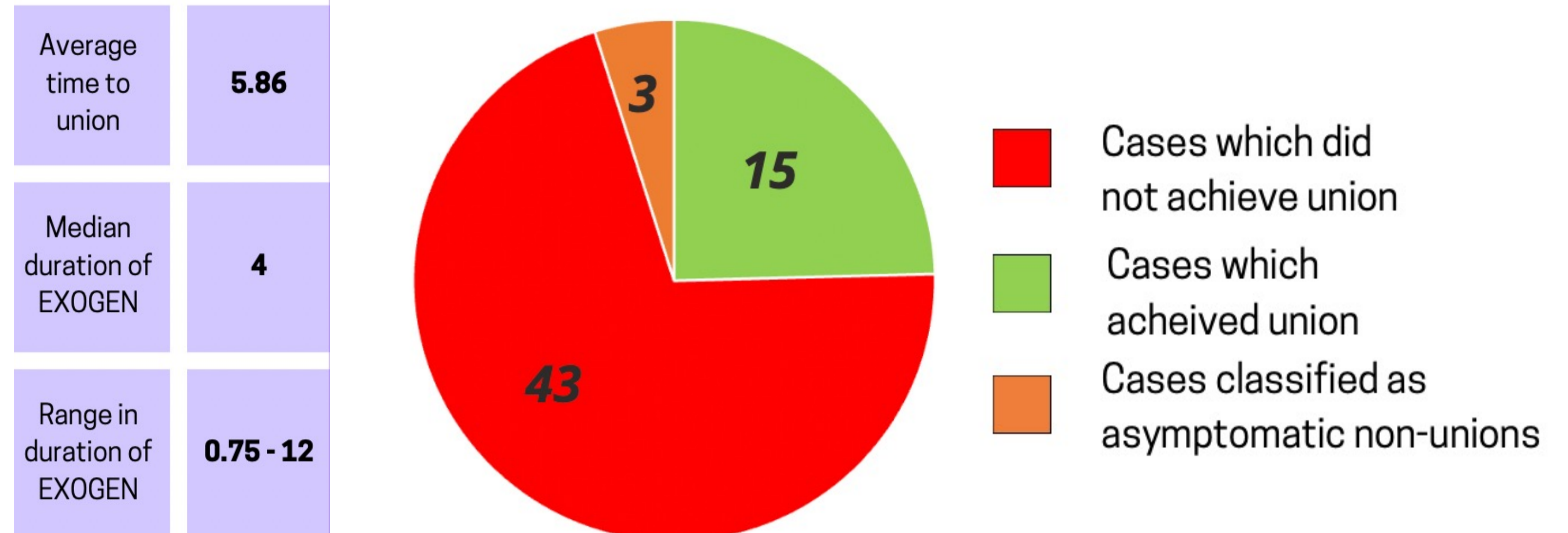
The final cohort consisted of 61 patients of which 29 were delayed unions and 32 non unions. Clinic letters and radiological reports were reviewed; a successful outcome from LIPUS was defined as radiological evidence of union



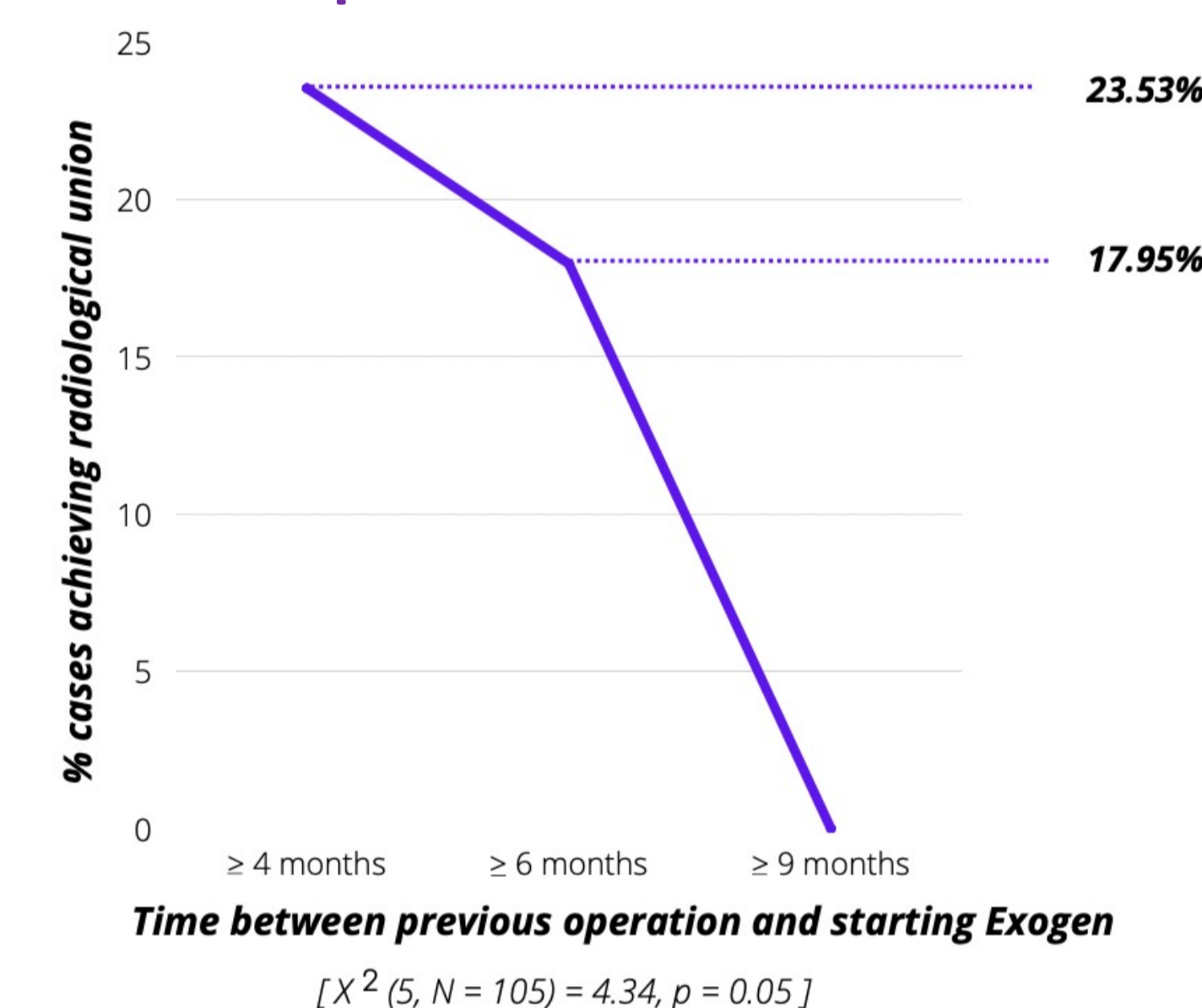
24 cases were isolated midfoot, 5 isolated forefoot and 14 isolated hindfoot. 18 cases had ≥ 2 regions of the foot affected.

RESULTS

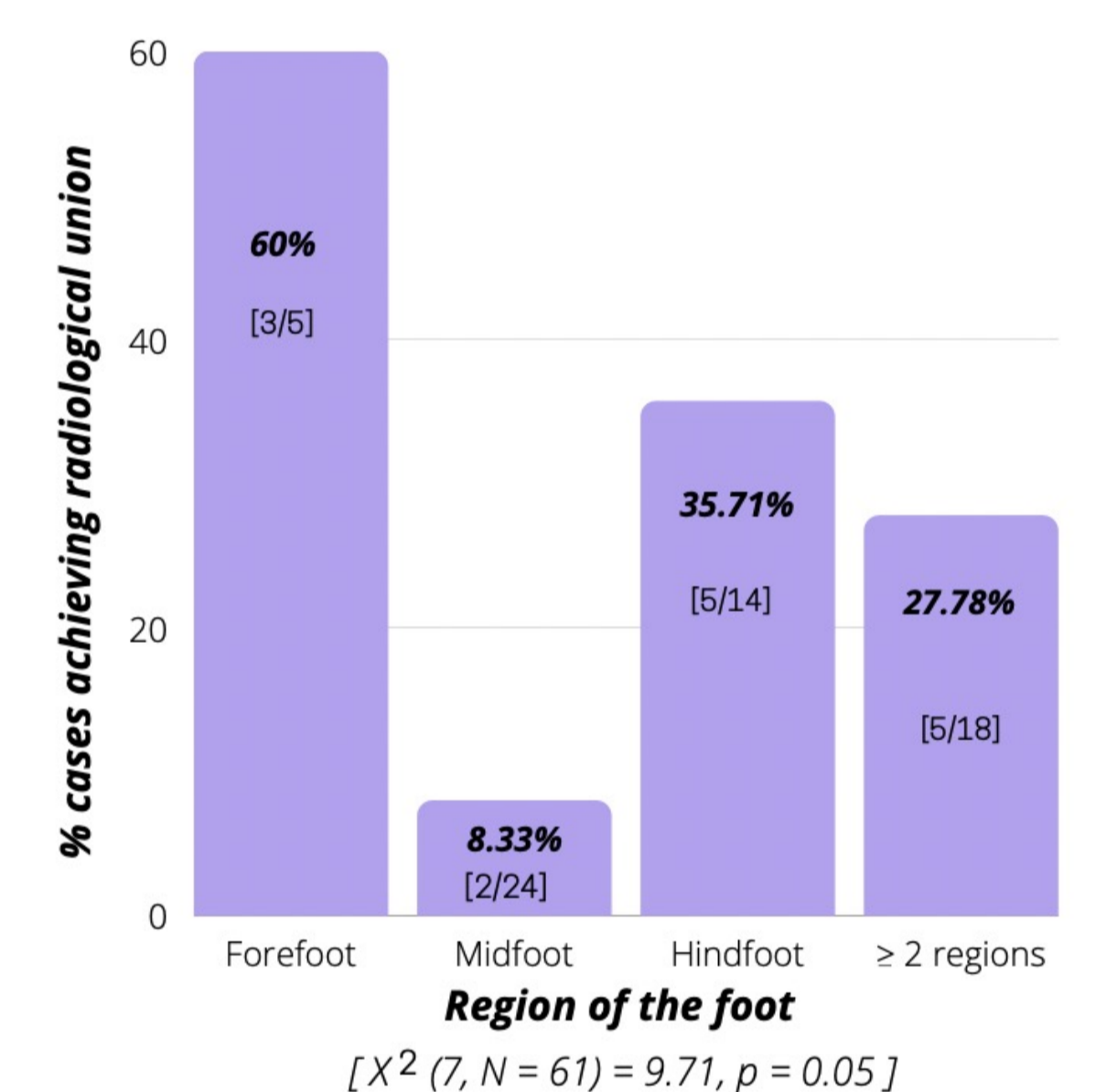
EXOGEN therapy had a success rate of 24.59% in treating delayed and non-unions following elective foot surgery.



EXOGEN therapy was also shown to have a higher success rate when started sooner after the index procedure.



EXOGEN therapy appeared to work best in the forefoot region and was least successful in the midfoot region.



Patient sub-group	Patients with an air-cast boot	Patients without an air-cast boot	Delayed unions	Non-unions	Smokers and/or ex-smokers	Non-smokers
Proportion achieving union [No. patients in subgroup achieving union/total No. in the subgroup]	11/39	4/22	9/29	6/32	2/16	13/45
% union	28.21	18.18	31.03	18.75	12.50	28.89
Statistical analyses	p > 0.05		p > 0.05		p > 0.05	

DISCUSSION

The union rate following LIPUS [EXOGEN™] therapy in our study was under 25% [15/61]. LIPUS was most effective for delayed or non unions following forefoot procedures and least effective for the midfoot.

It was also noted to be more successful when started early. If the NICE guidance for fractures [starting treatment after 9 months] had been adopted, the failure rate could have been higher.

We looked at some factors including immobilisation, delayed vs non unions and smoking which could affect bone healing. However, in this cohort, the sub-group analysis was not statistically significant.

CONCLUSION

LIPUS IS NOT AN EFFECTIVE TREATMENT METHOD FOR DELAYED UNIONS & NON-UNIONS FOLLOWING ELECTIVE FOOT SURGERY.

References: 1. Akin osteotomy. Foot Ankle Surg. 2018 - M Herrera Perez et al. 2. Proposing a Predictive Risk Assessment Model. Foot & Ankle International. 2015 – G Thevendran et al. 3. NICE Medical Technologies Guidance [MTG12] EXOGEN ultrasound bone healing system for long bone fractures with non-union or delayed healing [updated: Oct 2019]