Canterbury Medical Research Foundation

Final report for Grant in Aid GIA3 2018

Grant recipient

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Grant details

GRANT TYPE	Grant in Aid	FUNDING ROUND	2018 Grant In Aid
GRANT REFERENCE	GIA3 2018	GRANT AMOUNT	$5,000

Final report

1. Scientific Assessing Committee report

Background

Manufacturing of magnesium-based implants and other metallic biodegradable medical devices are nearly non-existent in New Zealand. This fact was strongly limiting the progress on the HRC funded project titled “Degradable metallic mini-plate and screw system for craniofacial osteosynthesis”. The project has been carried out by the ORTHOMAG Group at the Department of Mechanical Engineering, University of Canterbury and the Department of Anatomy, University of Otago. It has been focused on investigating the in-vivo degradation of magnesium-based mini implant systems. There it was critical for the project to establish in-house manufacturing of magnesium implants for small series production. Although the Group is equipped with a precision CNC unit, there was still a lack of tooling, work-piece holding devices. The In-Aid grant enabled the researchers from the Group to purchase these essential devices and accelerate the production a few prototypes of magnesium implants.

Materials and Methods

For the production of implants, the mechanical design of a mini plate screw-system was developed. The design was prepared to be machined with the use of the precise CNC machining technology. A wide variety of milling cutters including custom made tools were ordered using the In-Aid grant and tested for implant manufacturing. Tool choice and milling parameters were optimised to achieve the best results and satisfy the requirements of the design.

Results and Discussion

A wide range of programming, precise CNC machining, and quality control activities resulted in a successful small production series of devices ready for implantation. It included both screws and plates. Its quality was evaluated as good bearing in mind further clinical tests with the use of animals. During a few implantability tests with the use of synthetic bone models and cadaveric bones they proved to be safe and delivered enough stability to fixed fractured bones. Moreover, further corrosion and mechanical tests showed satisfactory and uniform performance of produced devices.

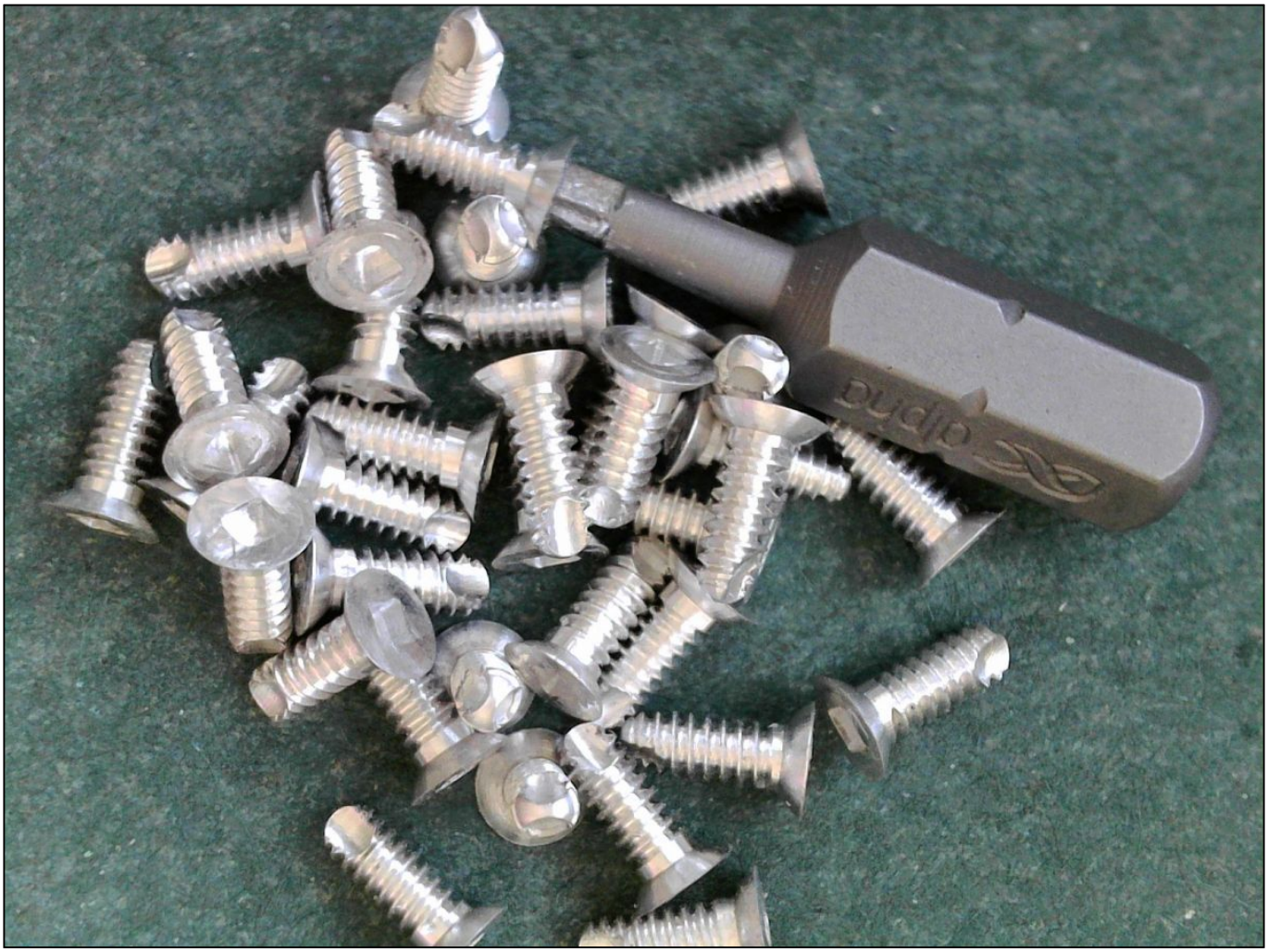
Conclusions

Although CNC milling procedure is not a preferred method of machining orthopaedic screws (precise CNC machining on Swiss-lathes is the one preferred), the results obtained within this pilot the study occurred to be satisfactory for a small production series, especially for pilot tests and small clinical trials.

2. Photographs

View an attachment by double clicking the icon to the left of the file name. Icons are not displayed and attachments are not accessible when this PDF is viewed in a web browser; you must open it in PDF reader software.

produced_screws.jpg
546.6 KiB



3. Feedback

This In-Aid grand turned to be an excellent help on our ongoing HRC project. Due to the change of circumstances, we decided to manufacture a small production series of cutting edge magnesium implants in-house using research group's facilities. This change of plans was connected to the fact that it occurred to be extremely difficult to outsource a quality manufacturer in New Zealand. The In-Aid grand made it possible to get implants manufactured using in-house production capacities, tested and implanted, and continue the progress of the current HRC project. I think that the availability of the Canterbury Medical Research Foundation should be advertised to the wider audience across universities and research institutions, especially those dealing with clinical studies, biomechanics and bioengineering. I found out about this opportunity when being informed by a colleague of mine but I wish that information was spread by my Department or College.