



# Vulcanized Rubber Single Axis Foot

KhAPO's members



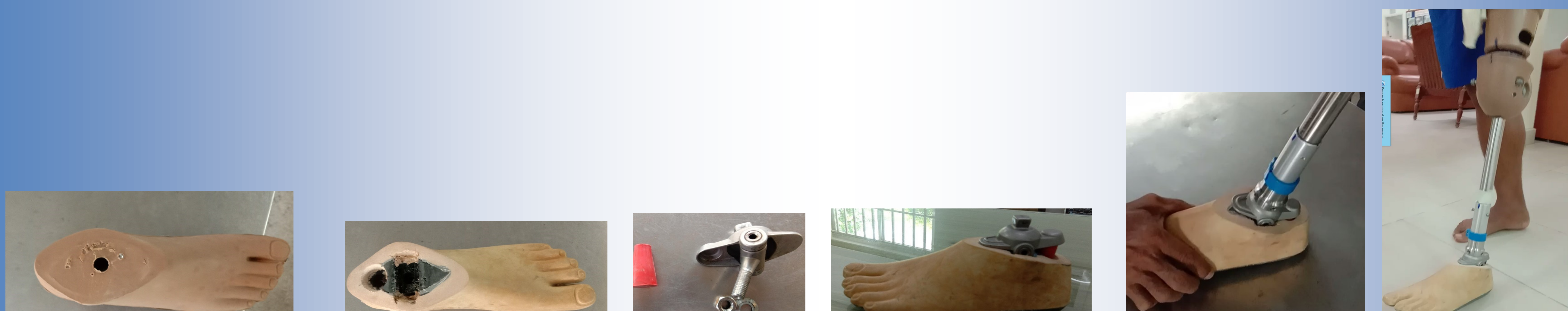
## 1. BACKGROUND

In Cambodia, patients who need the prosthetic foot have limited choices for their prescribed prosthetic foot. Only Solid Ankle Cushion Heel (SACH) foot is prescribed for every clients in both national and regional physical rehabilitation centers. Clinically and biomechanically, prescribing SACH foot is not always sufficient to meet all level patient's disabilities, level of activities and age differences. So far both foot factory and orthopedic component factory (OCF) in Cambodia have not produced single axis foot to supply to the needs where price of imported proper single axis foot cannot be afforded by most Cambodian people with disabilities and the imported single axis foot does not last long with Cambodia's climate.

**2. Aims:** To explore possibilities in producing local, affordable, and durable single axis to meet some patient's needs. We expect that new foot design will last at least for one year

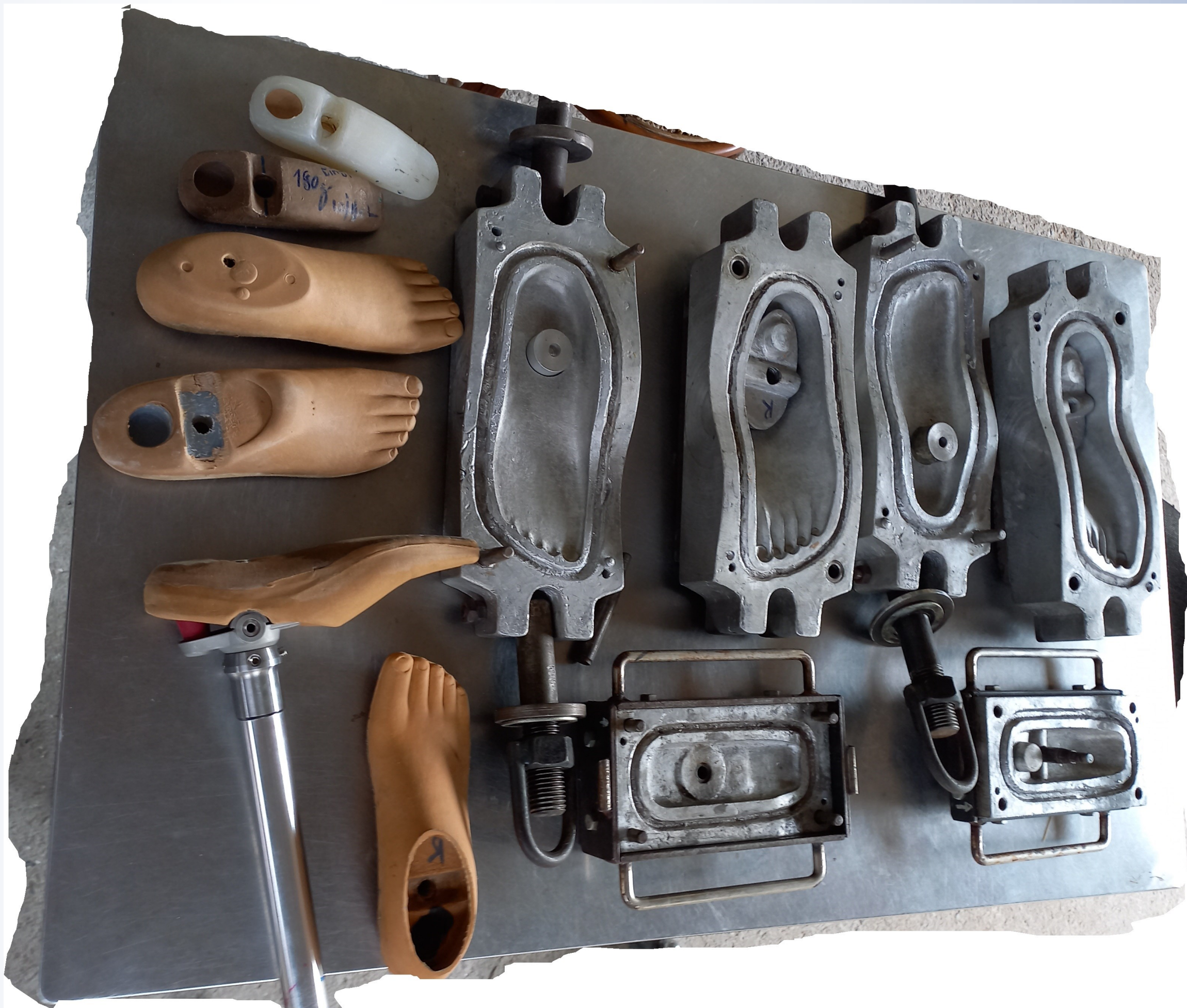
## 3. Method:

Idea of developing vulcanized single axis was evolved from modified vulcanized SACH foot attached with Chinese ankle axis adapter. That modified vulcanized rubber single axis foot was tested with two patient for one years, in 2019-2020. The result of that modified single foot work well. The proper mold for vulcanized rubber single axis foot was recommended. Through the Cambodian Association of Prosthetists and Orthotists, a proposal was requested to ISPO Norway to sponsor development of proper foot mold and foot keel to produce vulcanized rubber single axis foot. The proposal was approved by ISPO Norway in February 2021. In March 2021 aluminum mold was ordered from the local mold maker and four feet samples were produced and tested on model patients since August 2021. The tested subjects have been followed up and interviewed every 3 months up to 12 months.



Initial idea

Photos from the left: (1) Cambodian SACH foot, (2)SACH foot is cut out for single axis adapter, (3) plantar flexion bumper and single axis adapter, (4) assembly single axis, (5)testing single axis foot, and(6) walking with single axis foot



Photos from the left top: (1) meeting foot production technical staff in Kien Klang National PRC, (2)Foot molds, keel mold and foot sample, (3) Weighing foot sample, 4-7 model patients participated for testing

## 4. Results

Only three vulcanized rubber tested samples were able to collect the feedback. Those three model patients were happy with the tested feet compared with their previous prescribed SACH feet.

Within one year, client can walk with that vulcanized single axis foot without any problem. Participants feel more confident and faster to walk with that tested foot compare with the SACH foot. They also feel more easier to walk on uneven terrain. From P&O's point of view that tested foot does improve gait pattern compared with SACH foot. In term of maintenance, there is not any broken point found in that tested feet, but the mechanical axis required to be lubricated every 5-6 months to prevent rust where the prescribed SACH foot is not required.

## 5. Research limitation

## 6. Discussion and conclusion

From the study, comparing with the vulcanized rubber SACH foot, it is clearly found that the patient got several benefits from that tested foot for instance the movement at the mechanical ankle axis improve gait pattern, walking confidence and stability. The vulcanized rubber single foot is more durable compared with imported polyurethane single axis foot. Regarding to the cost, if it is made in mass production, the vulcanized rubber single axis foot will be cheaper than imported single axis foot. To help patient's needs with their environment , availabilities and affordability, the investment should be done for more comprehensive research and to product this kind of foot.

## 7. ACKNOWLEDGEMENT:

- KhAPO expresses sincere gratitude to
- ISPO Norway for sponsoring the research budget
  - Exceed Worldwide for offering fitting premise for model patients to come for testing
  - Model patients , friends for participating research and feedbacks
  - KhAPO 's members for helping and advising, especially to members who spent their weekends and holidays to work on this projects.
  - And Kien Klang National Physical Rehabilitation Center for helping producing the foot samples