Innovative Application of Scanning, Printing and Pressure Sensors Technologies to Improve Patient Experience in Auricular Keloids Management

Ka-Wing Wong, Ching-Sheung Chan, Wai-Kin Ching

Department of Occupational Therapy, North District Hospital, Hospital Authority, HKSAR

BACKGROUND

Auricular keloids pose significant clinical challenges due to their high recurrence rates, cosmetic impact, and potential discomfort for patients. Compression or pressure therapy by splinting as adjunct treatment has been reported to be effective. An innovative application of 3D scanning and printing technology as well as pressure sensors to increase the precision of splint fitting, thereby shortening the therapist–patient contact time and reducing the frequency of clinic visits. The aim of this study is to explore the feasibility of technology applications to improve the efficiency and comfort level for patients in auricular keloid management.

METHODS

A case study methodology was used. Following the occupational therapist´s keloid assessment during the first therapy session, the auricular keloids were scanned using a portable 3D scanning technology. An individual ear model was made by 3D printing for testing and fitting of the compression splint without the presence of the patient. Pressure sensors were applied to measure the optimal pressure provided by the compression adjustable splint. On the second session, the therapist might use the ear model to empower the patient and teach them how to fit the splint. Minor adjustments would be made if necessary to increase the level of comfort of the compression splint. Patients' conditions were followed up by mixed tele–mode and physical–mode follow–ups according to the patient's level of competency in self–management and the needs of the compression splint renewal. Users' satisfaction survey, adherence to compression splints, keloid conditions, and logic model framework analysis would be used to evaluate the inputs, outputs, and outcomes of this innovation.

RESULTS

Three patients with auricular keloids with sizes ranging from 1 to 2 cm^2 completed the 6-month therapy. Keloid volume, measured via comparative 3D imaging, was reduced by an average of 34%. Vancouver Scar Scale scores improved from a mean of 8.7 at baseline to 6.7 at 6 months, reflecting positive changes in vascularity, pliability, and height. The self-administering survey reported an average daily splint-wearing time of 17 hours, demonstrating strong adherence to therapy. All 3 patients reported the therapy arrangement, including the duration of assessment, scanning, fitting, and frequency of follow-ups, was highly satisfactory.

CONCLUSION

The integrative application of low-cost, market-available technologies in scanning, ear model printing, and pressure sensors to auricular keloid management is promising to improve the efficacy and adherence to the compression therapy by reducing the patient visiting time and frequency without compromising the quality of the services.

Contact Information

First author (presenting author)

Full name:	Ka-Wing WONG
Academic degree(s):	MSc in Stroke and Clinical Neurosciences, The Chinese University of Hong Kong
Institution:	North District Hospital, Hospital Authority, Hong Kong
Address:	Occupational Therapy Department, 1/F, North District Hospital, Sheung Shui, Hong Kong SAR
Email address:	wkw160@ha.org.hk
Disclosure	I declare no conflict of interest, financial or otherwise

Co-author(s)

Full name:	Ching-Sheung CHAN
Academic degree(s):	MSc in Musculoskeletal Medicine and Rehabilitation, The Chinese University of Hong Kong
Institution:	North District Hospital, Hospital Authority, Hong Kong
Address:	Occupational Therapy Department, 1/F, North District Hospital, Sheung Shui, Hong Kong SAR
Email address:	ccs721@ha.org.hk
Disclosure	I declare no conflict of interest, financial or otherwise

Full name:	Wai-Kin CHING
Academic degree(s):	MSc in Stroke and Clinical Neurosciences, The Chinese University of Hong Kong
Institution:	North District Hospital, Hospital Authority, Hong Kong
Address:	Occupational Therapy Department, 1/F, North District Hospital, Sheung Shui, Hong Kong SAR
Email address:	chingwk1@ha.org.hk
Disclosure	I declare no conflict of interest, financial or otherwise

Disclosure Declaration

All authors declare that they have no relevant or material financial interests that relate to the research described in this paper.