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A Critical Comparison Of Rapid Prototyping And Additive Manufacturing In Extra-Oral Prosthesis Body Production

Dominic Eggbeer, Richard Bibb, Peter Evans, *et al*

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Loughborough University

RSM Institute for Reconstructive Sciences in Medicine

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The efficacy of computer-aided technologies in extra-oral prosthesis design has not yet been fully proven

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- Positional accuracy
- Shape
- Edge thickness
- Colour
- + Mechanical & bio properties

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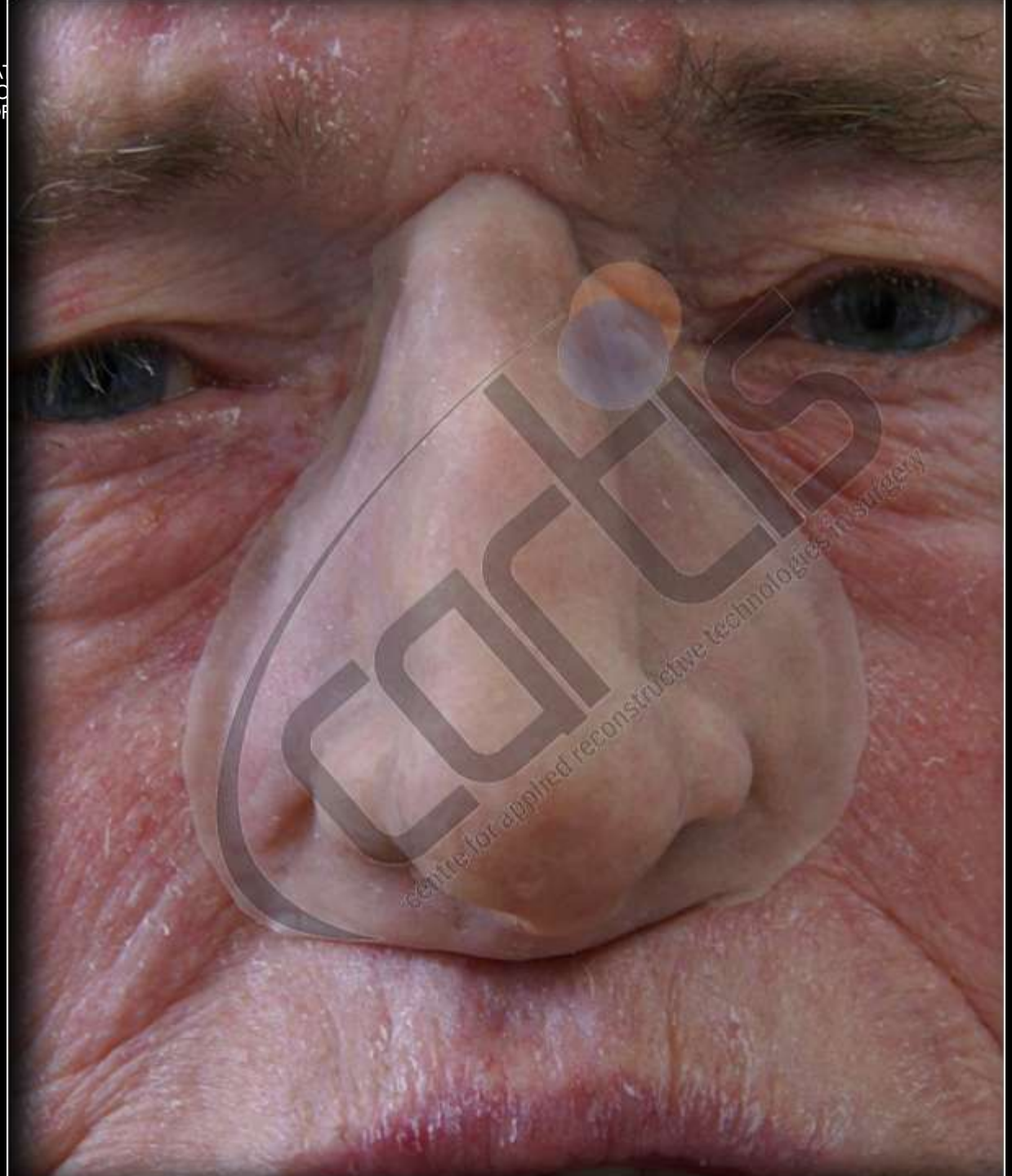
Compare the outcomes of 3 viable methods:

- Conventional production
- Digital design and production of a mould
- Digital design and direct fabrication of a prosthesis body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Base plate fabrication

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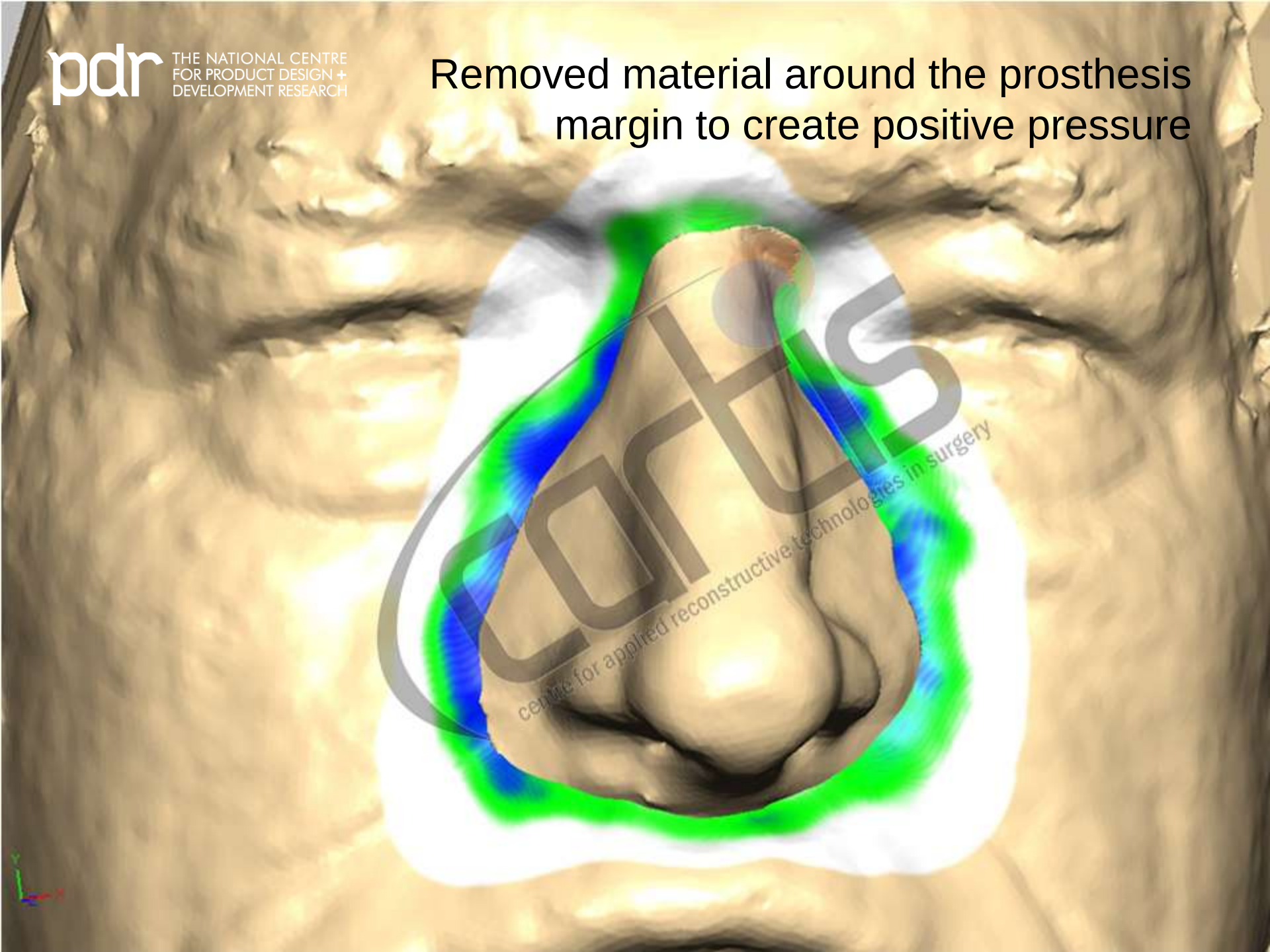
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Removed material around the prosthesis margin to create positive pressure
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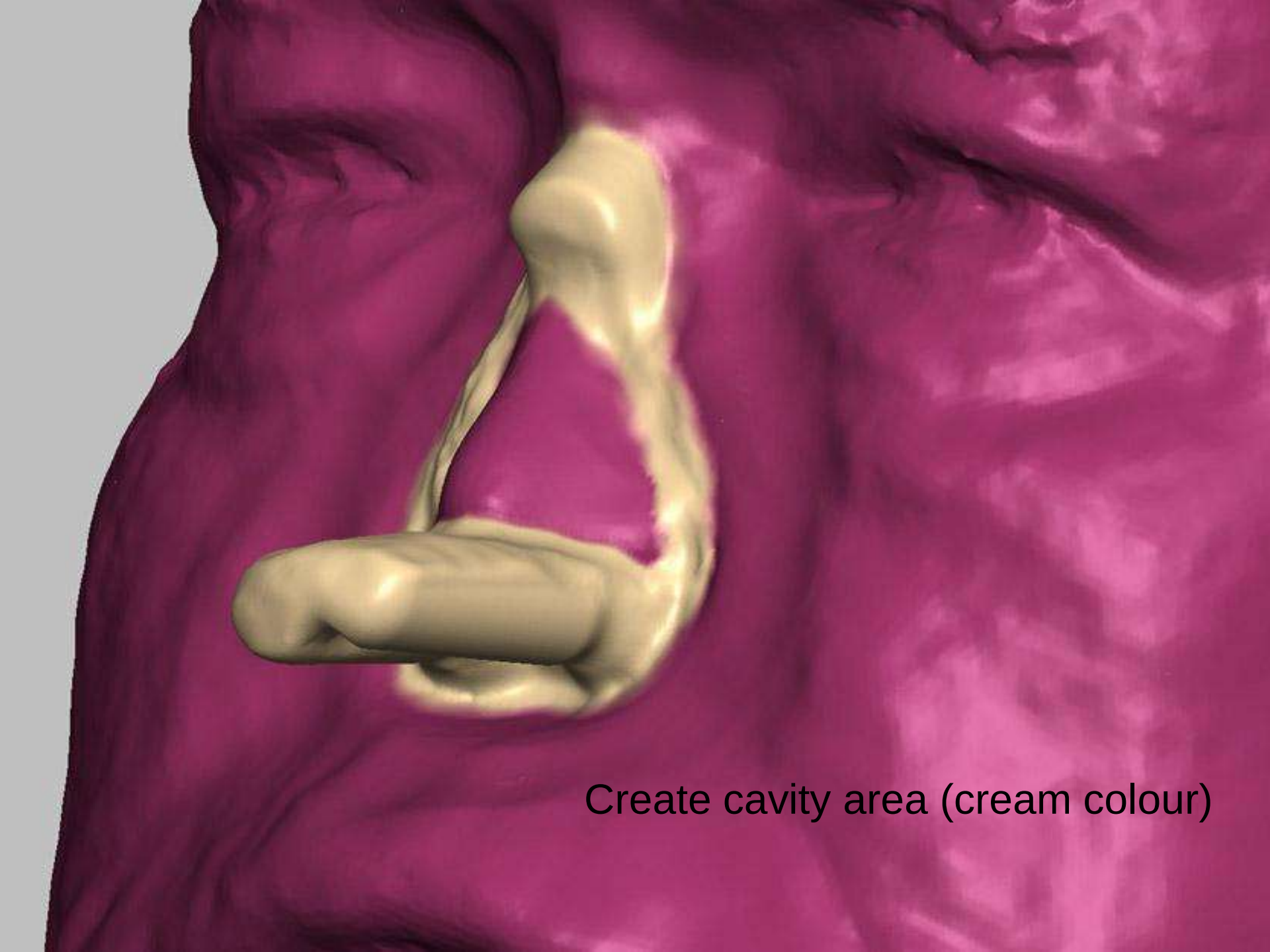
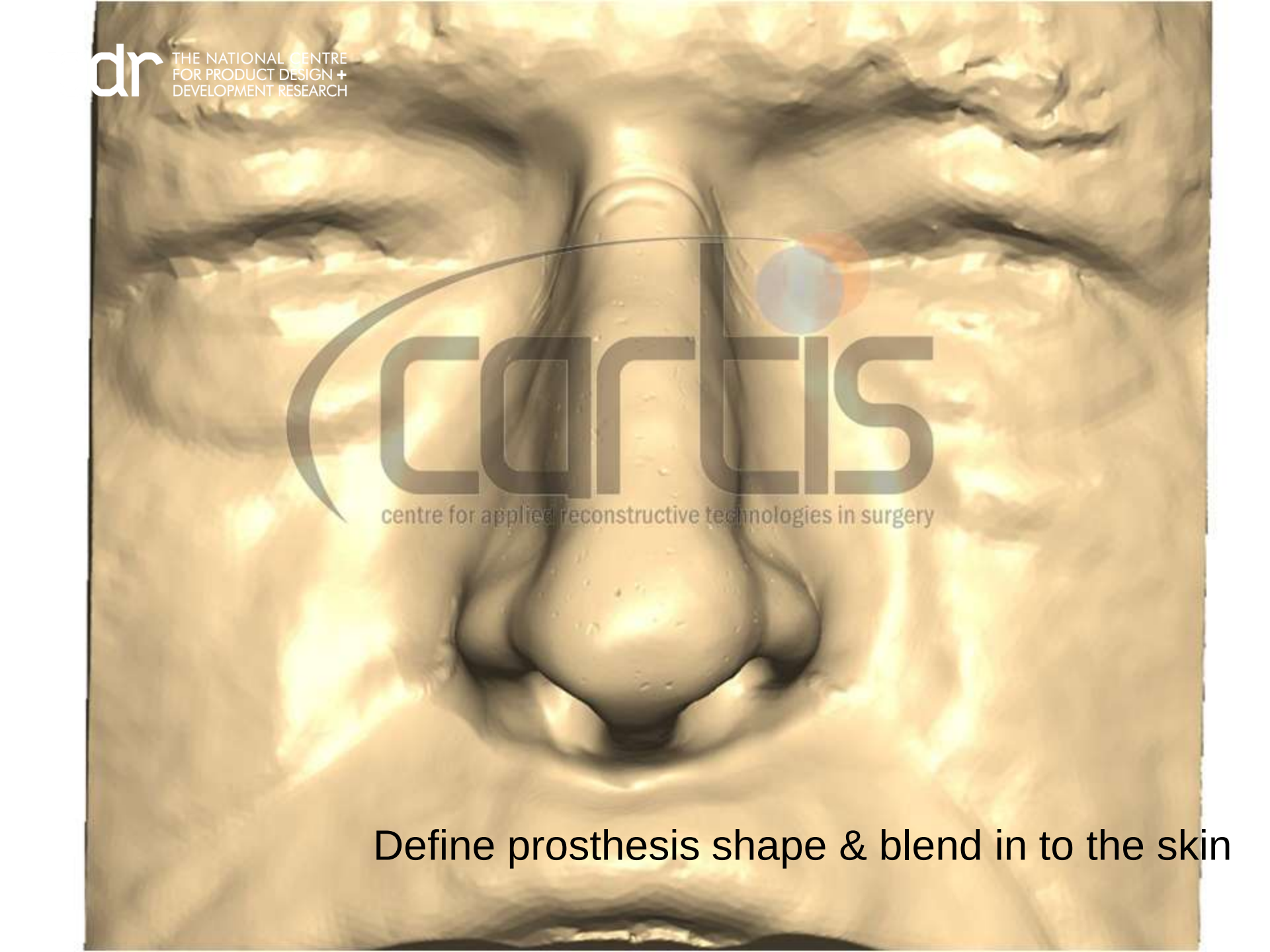
Mould Design


Create cavity area (cream colour)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Define prosthesis shape & blend in to the skin

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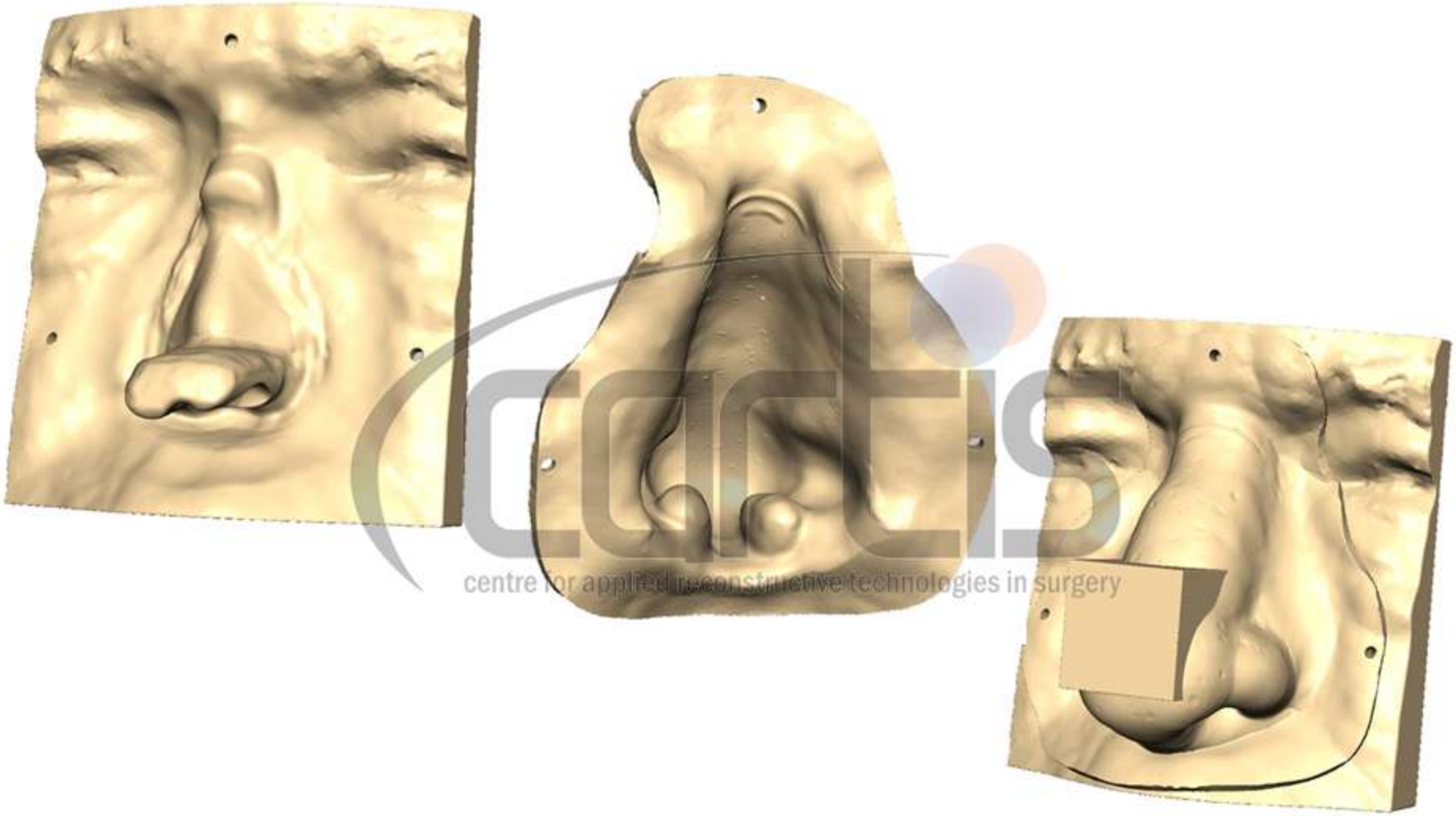

Outside of the mould created by taking a virtual impression

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Pattern Design


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Edge thickness from 100-200 micron in FreeForm

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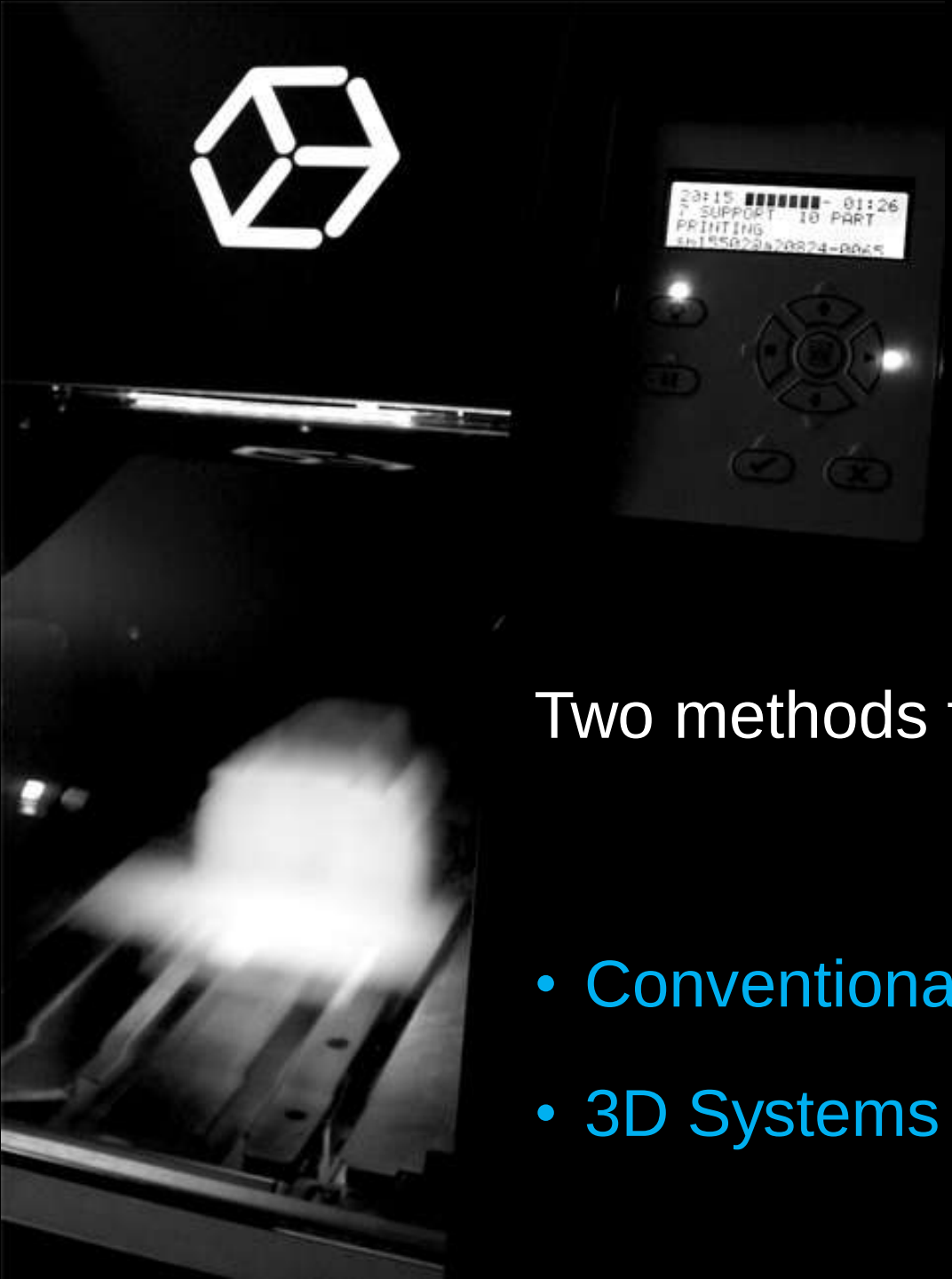
Production



Two methods for clinical application

- Conventional plaster mould
- 3D Systems ProJet for the mould

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Conventional Production


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Mould using ProJet 3D Printing

Material cost = £41 (approx. 45 Euro)


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Direct Objet Fabrication Trial


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Tango, 26a shore material to create a base

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Results

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Conventional	Mean	Std. Dev.
Position	3.158	1.068
Shape	2.474	1.219
Colour	3	1.202
Edge	1.947	1.129

RP mould	Mean	Std. Dev.
Position	3.842	0.834
Shape	4	0.745
Colour	3.842	0.688
Edge	3.526	0.772

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Ttest. P=0.05. 2 tails, type 2. n=19

Position	0.034241
Shape	0.000043
Colour	0.011873
Edge	0.000014

Indicates a high degree of confidence that RP produced moulds can work in nasal prosthesis cases

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Further work

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Loughborough University

Russell Harris *et al.*

Cadaver Vs. 3DPrinted

Incorporates non-linear textures and colour patterns. No manual colouring of the model

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