



What is 3D printing in Shoulders???

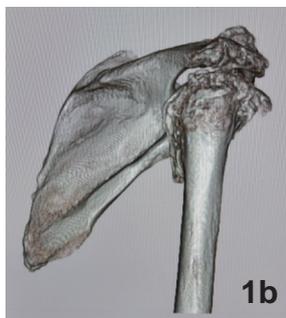
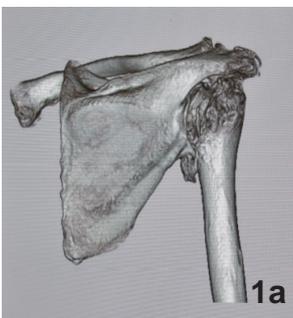
By Professor Ted Mah

Shoulder, Elbow, Hand & Microsurgery

A couple of patients asked me recently what does 3D printing has to do with shoulders? I told them it is one of the biggest scientific advances in shoulder surgery in the last 20 years. Let me elaborate...

Shoulder replacement surgery has been slow to develop until more recently because of technical issues related to implant design and instrumentation. The longevity of shoulder replacement is still not as good as hips and knees but it is changing for the better. In the past there were many shoulders with anatomical deformity from arthritis and fractures that were not amendable to surgical treatment, but that has now changed thanks to the development of 3D printing, patient specific implants and better instrumentation. These advances have enabled me to tackle some of the more difficult cases previously not amendable to surgery and therefore provide better service and function for this group of patients. *Detail knowledge, critical judgement, high technical skill, good communication and empathy* are still the fundamental elements of a good Orthopaedic surgeon, but there are now more tools at our disposal that allows high precision surgical planning. 3D printing is just one of such example. The following is a real example of how such technology has enable a careful detailed planning and the production of a customised prosthesis for the patient.

A patient with advanced degenerative arthritis of a shoulder is complicated by severe bone deficiency on the glenoid. This is best seen on the CT reconstruction (Fig 1a &b).

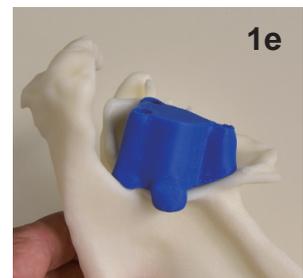
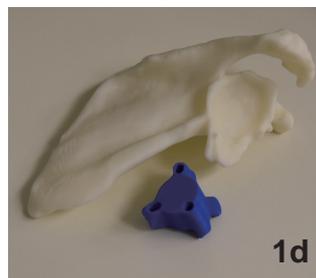


However, even CT reconstruction fails to demonstrate the severity of the defect until 3D printing technology comes along. 3D printing can

generate a model of the glenoid that allow better discussion and explanation to the patient as to why the reconstruction is so difficult (1c).



The 3D printing will also allow engineers to design and produce a model implant that will fully correct the deformity specific to the patient (Patient Specific Implant) (1d & e).

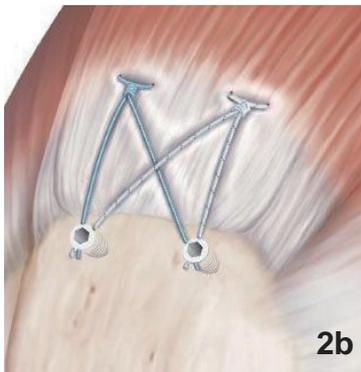


The surgeon can then study and appreciate the anatomical and technical aspect of the PSI model and "fine tune" the final implant design before production (if).

Yes there is an increase cost associated with such technology, but the increase cost is justified if it precludes the expenses associated with performing surgery using a standard implant, which is difficult, less reliable and more likely to fail, leading to the need for early revision surgery and prolong recovery time. This new technology and patient specific implant *does not negate the need for critical thinking and high technical skill, rather the contrary as precision means less room for surgical error*, and younger surgeons will usually take many years to acquire the skill and judgement as the learning curve is usually quite steep.

On another topic, there is an avalanche of patients presented with shoulder impingement, bursitis,

rotator cuff pathology, AC joint problem and biceps tendonitis. Previously surgeons have been conservative in not advising surgery to patients with these shoulder problems. However, there is an increased demand from patients requesting surgical treatment because they now realised the overall good outcome from surgical treatment, either through their personal experience or that of their friends and family. There is a general misconception that pure arthroscopic (key hole) surgery is better than open surgery, not true! Indeed the gold standard remains the combined arthroscopic and mini open surgery. This is because it offers the best of both techniques – arthroscopy for better visualisation and debridement, whilst mini open component offers direct visualisation of any residual impingement that may not be easily seen on arthroscopy. Whilst synthetic material / substitute for large rotator cuff repair has proven failure, knotless fibretapes / ribbons (2a) rather than strings or sutures (2b) has proved to be highly effective in cuff repair because the tapes do not cut through the already weakened rotator cuff, irrespective of the technique used, may it be single or double row repairs. I repair the soft tissue carefully and completely during shoulder surgery so that early mobilisation can begin and therefore less chance of developing a frozen shoulder. There is increasing evidence to show that treating AC joint pathology and bicipital tendonitis concurrently with



shoulder impingement and bursitis allows better outcome and reduce the need for further surgery.

Lastly, in relation to shoulder instability, arthroscopic shoulder stabilisation using various knotless suture anchors remain reliable and produces good long-term results.

For further information on any of the topics discussed above please contact Professor Ted Mah.

Ted Mah is a prominent internationally renowned shoulder, elbow and hand surgeon. He is the Professor of College of Medicine and Public Health, Flinders University, immediate Past President of Asia Pacific Orthopaedic Association and Salisbury-Elizabeth Medical Association; past President of Australian Chinese Medical Association (SA) and South Australian Hand Surgery Society. He sits on 5 Editorial Boards and is the Editor for Hand & Upper Limb Section of JOS and Mercer Textbook of Orthopaedics. Prof Mah has taught orthopaedics and examined in many Asia Pacific countries. Prof Mah consults at North Adelaide rooms and provides Hand and Upper Limb service at Lyell McEwin Hospital. Prof Mah is committed to provide detailed sound unbiased advise to patients with shoulder and hand problems at his rooms in North Adelaide, irrespective of patients' insurance status.

Contact / Appointments:

Professor Edward (Ted) Mah

North Adelaide Medical Centre
53 Gover Street, North Adelaide
Australia 5006

Phone: 8361 9888
Fax: 8361 9122
Email: nasc5006@hotmail.com