While there is no major controversy in managing stable fractures of the fingers, a consensus has not yet been reached in treating unstable fractures of the phalanges and metacarpals of the hands. Both static and dynamic splints have been used for treating selected cases of unstable phalangeal and metacarpal fractures, for which good outcomes are noted. However, for fractures with rotational deformities, surgery is the mainstay of treatment. Plates and screws, intramedullary nails, external fixation, and Kirschner wires or screws alone have all been described with mixed results. It has been noted that plates and screws provide the most rigid and secure fixation of the fracture both clinically and biomechanically. However, difficulties can still be encountered when they are used for treating comminuted, intra-articular or metaphyseal fractures, or fractures with osteoporotic bones.

For treatment of hand fractures, the main aim is to stabilise the fracture with any method so as to allow early mobilisation, which will in turn minimise the soft-tissue scarring and tendon adhesion. Recent success in using locking plates for distal radius fracture fixation has led to the idea of applying this technology to the fracture fixation in hands. There are numerous types of locking plates on the market. While they each have minor differences in design, they all boast their enhanced strength as compared with non-locking plates. This is based on the principle that the locking plate and screw construct is designed to fail as a unit, rather than through sequential screw failure (as in a non-locking plate and screws construct). Biomechanical studies using saw-bone and animal models have also confirmed the superiority of locking plates over screws alone. The failure of locking plates with monocortical fixation has been equal to that of non-locking plates with bi-cortical fixation. As a result, no protection should be needed post-operatively and immediate mobilisation exercise should be allowed. Moreover, due to its superior strength, fewer screws and engagements of the cortices (i.e., monocortical fixation versus bicortical fixation) are needed for fracture fixation. This in turn minimises the chance of tendon irritation or even tendon rupture, caused by the bicortical screws. In theory, locking plates would be most beneficial clinically for managing osteoporotic fractures, comminuted fractures, fractures with segmental bone loss, metaphyseal fractures and intra-articular fractures.

There are many different designs of locking plates, and each has its own advantages and disadvantages. Due to the presence of locking threads of the plate, the design may not be as low profile as its counterpart non-locking plate. This may be more noticeable in the management of phalangeal fractures as they have a very close tendon-bone relationship. As a result, tendon adhesion and finger stiffness may become a problem. The design of the screw that enables its ‘cutting’ into the plates, creating a new thread path, appears to solve the problem of plate prominence while achieving a variable angle locking mechanism. However, the metals that are ‘cut’ out may cause irritation, leading to more foreign body reaction and tendon irritation. Moreover, it can be technically demanding, as any exchange of screws after the insertion could lead to the failure of the locking mechanism. Lastly, the variable angle screws have been noted to be less rigid than the fixed angle screws. Thus the number of screws needed for fixation again remains unknown. There are currently only a few studies describing the use of locking plates in finger fractures and unfortunately the results have not been encouraging. Diaconu et al’s study treated 15 extra-articular fractures of the first metacarpal bone using locking plates (double-row locking plates and T-locking plates), but this showed no significant benefit. Three out of a total of five failures noted in his study were using T-locking plates. The authors subsequently concluded that while the double-row locking plates might be of benefit in the treatments of finger fractures, the T-locking plates were not strong enough to allow early mobilisation post-operatively. Meanwhile, a study by Facca et al revealed significantly poorer mobility in managing fifth metacarpal neck fractures using locking plates when compared with intra-medullary wires and external splint. These disappointing results may be due to the small sample sizes in the reported studies, so a significant difference cannot be detected. Secondly, the fracture configurations chosen for the studies may not have been of the targeted group for using locking plates. As mentioned earlier, the theoretical beneficial effects of locking plates are mainly of a select group of fractures. For metacarpal neck fractures without rotational deformities, a positive outcome may not be noted when compared with intra-medullary wires, or even with a splint alone. In our preliminary experience of using locking plates (Synthes’ locking Compact Hand set) for phalangeal and metacarpal fractures, the results have been promising. A total of 16 patients were treated with locking plates, of which 75% of fractures were metaphyseal, intra-articular or comminuted. Markedly, 75% of patients achieved good or excellent total active motion (i.e. > 180°) at three months post-injury. Furthermore, 70% of patients could achieve > 75% of their normal power grip after three months. No significant complications (i.e. nonunion, implant failure and wound infection) were noted.

As the problem of the plates profile has not yet been solved, second surgeries for removal of implants, together with tenolysis,
may be necessary.\textsuperscript{26} In fact, in some hand centres, it is routine to offer removal of plates when the fracture heals. In recent years, the possibility of using bioabsorbable implants for fracture fixation of the hand has been discussed.\textsuperscript{27,28} However, these implants are not yet popular due to their observed drawbacks: early failure caused by their compromised strength\textsuperscript{29}, and subacute or delayed foreign body reactions (up to two years) requiring surgical intervention.\textsuperscript{30} Thus unless these problems are resolved, bioabsorbable implants are not yet recommended for routine use.

The ideal implant for hand and finger fractures is yet to come. While it should allow for anatomic restoration and stable fixation, it should at the same time generate minimum soft-tissue damage, and allow immediate mobilisation post-operatively to inhibit the formation of scarring and adhesion. Until then, we should appreciate the advantages and drawbacks for each implant and technique, and formulate the treatment plan accordingly for each individual fracture.

References