Nuts and Bolts: Dimensions of Commonly Utilized Screws in Upper Extremity Surgery

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A plethora of screw designs and sizes are available from multiple companies for use in upper extremity surgery. Knowing the dimensions of screws is critical in the treatment of bone of varying dimensions for fractures, osteotomies, or arthrodeses. Although many screws are named by their major thread diameter, this is not always true. Because of this confusing nomenclature and vast number of options, we sought to review the most commonly used screws and codify their dimensions into a readily available article and reference chart. This article highlights the basic dimensions of commonly used headless screws, stand-alone lag screws, non-locking and locking screws for plating, and biocomposite screws. Commonly described treatments using these screws include fixation of elbow, wrist, carpal, metacarpal, and phalangeal fractures and osteotomies, as well as arthrodeses of upper extremity joints. This article and its tables are by no means exhaustive of all commercially available implants. The focus is on the most commonly used implants in the United States as of 2014. *(J Hand Surg Am. 2015;40(2):368–382.*

Key words Screws, cannulated screws, distal radius fracture, metacarpal fracture, phalanx fracture.

SCAPHOID FRACTURES

As demonstrated by McCallister et al,[1] the center–center positioning of a cannulated headless compression screw (HCS) along the long axis of the scaphoid is most biomechanically sound for the treatment of transverse fractures. Newer-generation headless compression screws (Table 1) have demonstrated greater biomechanical compression but not improved clinical outcomes compared with earlier-generation dual-threaded, headless screws (Table 1) or standard headed cannulated screws (Table 2).[2–4] In fact, 3.5-mm standard cannulated screws are viable options for scaphoid fractures particularly if headless screws are unavailable, although their use has dwindled owing to concern regarding intra-articular hardware irritation.[2]

Many commercially available headless screws are used to stabilize scaphoid fractures. One subset of these screws employs a fully threaded design with variable pitch within the threads. AcuMed (Hillsborough, OR) offers 3 screws in the Acutrak 2 line, including the standard, mini, and micro Acutrak 2 screws. All are fully threaded with variable pitch along the entire length. The mini screw has a leading distal outer diameter (DOD) of 3.5 mm and a trailing proximal outer diameter (POD) of 3.6 mm and is the most commonly used size to stabilize scaphoid fractures. The standard screw (DOD 4.0 mm and POD 4.1 mm) may be used for larger patients whereas the micro screw (DOD 2.5 mm and POD 2.8 mm) is typically too small for scaphoid fixation. Arthrex (Naples, FL) offers the Compression FT 3.5 mini, a fully threaded screw with a stepped, variable-pitch design and tapered minor thread diameter but constant major thread diameter (3.6 mm).

A second subset of these screws employs a dual-threaded design similar to the original Herbert-Whipple

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TABLE 1. Headless Screws

Company	Screw Name	Indications	Thread Design	Material	Shaft Diameter, mm	Major Thread Diameter at Tip, mm	Major Thread Diameter at Head, mm	Drill Size, mm	Guide Wire, mm	Length (Step Increment), mm	Cannulated (Y/N)
AcuMed	Acutrak Mini	Radial head, capitellum, metacarpal, IP arthrodesis	Full, variable pitch	Ti	Tapered	2.8	3.1–3.6	Taper	0.9	8–26 (2)	Y
AcuMed	Acutrak Standard	Scaphoid, capitellum, carpal arthrodesis, MCP arthrodesis	Full, variable pitch	Ti	Tapered	3.3	3.8–4.6	Taper	1.1	12.5–30 (2.5)	Y
AcuMed	Acutrak Fusion	IP/MCP arthrodesis	Full, variable pitch	Ti	Tapered	2.0–3.3	2.5–4.0	Taper		14–24 (2), 27, 30, 32, 37	N
AcuMed	Acutrak 2 Micro	Radial head, capitellum, metacarpal, IP arthrodesis	Full, variable pitch	Ti	Tapered	2.5	2.8	Taper	0.9	8–14 (1), 16–30 (2)	Y
AcuMed	Acutrak 2 Mini	Scaphoid, carpus, radial styloid, capitellum	Full, variable pitch	Ti	Tapered	3.5	3.6	Taper	1.1	16–30 (2)	Y
AcuMed	Acutrak 2 Standard	Scaphoid, capitellum, carpal arthrodesis, MCP arthrodesis	Full, variable pitch	Ti	Tapered	4.0	4.1	Taper	1.4	16–34 (2)	Y
AcuMed	AcuTwist	DIP fusion	Full, variable pitch	Ti	Tapered	1.5	2.0	1.1		10–30 (2)	N
AcuMed	Biotrak Mini	Scaphoid, carpus, capitellum	Full, variable pitch	PLA	Tapered	3.2	3.5–3.7	Taper	0.9	16–24 (2)	Y
AcuMed	Biotrak Standard	Scaphoid, carpus, radial styloid capitellum	Full, variable pitch	PLA	Tapered	3.6	4.3–4.7	Taper	1.1	16–24 (2)	Y
Arthrex	Micro Compression FT	Radial head, IP arthrodesis, metacarpal	Full, stepped variable pitch	Ti	Tapered	2.8	2.8	2.0	0.86	8–14 (1), 16–30 (2)	Y

(Continued)