Orthotic Shell Selection Guide

Rigid vs Semi-Rigid vs Soft / Prefabricated vs Custom / Heel Cup Depth

Shell selection determines the degree of mechanical control, patient comfort, and clinical outcome. An overly rigid shell on an already rigid, cavoid foot increases injury risk; an overly soft shell on a severely pronated foot provides no meaningful control. This guide covers the key decision points in shell selection: stiffness category, fabrication method, and heel cup specification.

1 Stiffness Categories

Category	Stiffness	Typical Material	Degree of Control	Patient Feel	Best Suited For	Cautions
Rigid	High	Polypropylene 4–5mm; Carbon fibre	Maximum STJ and midtarsal control	May feel firm initially — adaptation period required	PTTD, severe flat foot, spastic conditions, high-control indications, hallux rigidus (1st ray stiffness)	Pes cavus; atrophic tissue; neuropathy; elderly — may cause pressure injuries
Semi-Rigid	Moderate	Polypropylene 3mm; co-polymer; 3D-printed TPU medium infill	Good control with flex	Comfortable for most patients; well tolerated	Most MSK presentations: plantar fasciitis, PFPS, MTSS, Achilles, general pronation	Very rigid foot types; advanced atrophy
Soft / Accommodative	Low	EVA 35–45A; Plastazote; PPT	Minimal control	Very comfortable; compliant to foot shape	Diabetic neuropathy, elderly, palliative, offloading, pes cavus cushioning, post-surgical	Any presentation requiring true biomechanical control — soft shells do not provide it
Flexible / Dynamic	Variable	EVA 55A; 3D-printed TPU low infill	Moderate — some energy return	Natural feel; good for athletic use	Athletic/sport where some flexibility and energy return is preferred	High-control indications; significant deformity

2 Prefabricated vs Custom

Factor	Prefabricated	Custom
Control	Generic shape — moderate control for average foot morphology	Matched to patient's foot morphology from cast/scan — superior control
Cost	Low–moderate	Higher — reflects fabrication time and materials
Turnaround	Immediate	Days to weeks depending on lab/fabrication method
Modifications	Limited — some have interchangeable wedges/covers	Unlimited — any modification can be incorporated
Evidence	RCTs show comparable outcomes to custom in many MSK conditions in average foot types	Superior for significant deformity, complex cases, failed prefab, non-standard foot morphology
Best For	First-line trial; mild-moderate presentations; normal foot morphology; budget-sensitive	Failed prefab; moderate-severe deformity; complex prescription requirements; PTTD; paediatric
Lifespan	6–18 months depending on material and use	2–5 years with appropriate material selection

A prefabricated orthotic trial is clinically appropriate for many first-line MSK presentations — particularly where foot morphology is within normal limits and the prescription is straightforward. Progress to custom if response is inadequate, morphology is significantly abnormal, or modifications beyond a prefab's capability are required.

3 Heel Cup Depth

Heel Cup Depth	Typical Height	Heel Control	Best Indications	Cautions
Standard	14–16mm	Moderate	General use; most everyday presentations	Insufficient for significant calcaneal eversion or fat pad atrophy
Medium	18–22mm	Good	Plantar fasciitis; moderate pronation; most MSK; paediatric	Check footwear heel counter height — may not accommodate
Deep	24–28mm	High	PTTD; severe flat foot; fat pad syndrome; heel pain with significant eversion	Haglund's deformity; calcaneal exostoses — may cause pressure; footwear limitations
Extra-deep / Total Contact	30mm+ or full contact	Maximum	Diabetic neuropathy; Charcot foot; severe deformity; pressure redistribution	Requires footwear with deep, wide heel box; specialist footwear often required

4 Shell Length Options

Length	Description	Best Use	Limitation
Full length (to toe end)	Shell extends under all toes	Toe deformities; neuropathy; maximum forefoot control	Bulky; limited footwear choice
Sulcus length (3/4)	Ends just behind metatarsal heads	Most MSK presentations; balanced control and shoe fit	No direct toe support
3/4 length	Ends at met heads	Tight footwear; dress shoes; sport shoes with limited depth	Reduced forefoot influence; no met dome possible

5 Quick Decision Summary

Shell Selection Decision Framework

1. Foot type rigid/cavoid? → Soft/accommodative or semi-rigid + lateral modifications.
2. Foot type flexible/pronated? → Semi-rigid to rigid + medial modifications.
3. Pathology requires maximum control? (PTTD, severe flat foot) → Rigid + medial flange.
4. Neuropathy, elderly, or offloading? → Soft/accommodative total contact.
5. First presentation, normal morphology? → Consider prefabricated trial first.
6. Failed prefab or complex morphology? → Custom fabrication.