

Supplementary Table S1. Coding tree – from raw data to themes.

Raw data example (open code)	Axial category → Theme
Screws holes are misaligned (1-2mm)	Technical shortcoming → Attribution of fit-related issues
“There is a contour mismatch at orbital rim”	Technical shortcoming → Attribution of fit-related issues
“Soft tissue constraints ignored during virtual surgical planning”	Planning workflow failures → Attribution of fit-related issues
“Poor DICOM segmentation”	Planning workflow failures → Attribution of fit-related issues
“Unexpected bone resorption/remodelling since scan”	Anatomical changes → Attribution of fit-related issues
“This is BS, this thing doesn't fit”	Verbal expressions → Intraoperative frustration & impatience
“Why doesn't this [expletive] thing work?”	Verbal expressions → Intraoperative frustration & impatience
“Just bend the last three holes in”	Premature decisions → Intraoperative frustration & impatience
“Can you open the angle up?”	Premature decisions → Intraoperative frustration & impatience
“Aggressive burring of the implant where it interfaces the bone”	Physical manifestation → Intraoperative frustration & impatience
“Instrument slamming”	Physical manifestation → Intraoperative frustration & impatience
“I don't know what the planner [biomedical engineer] did here”	External/team-directed attribution → Intraoperative frustration & impatience
“Re-checked planning report”	Protocol adherence → Emotional regulation and perseverance
“Re-sequenced steps”	Protocol adherence → Emotional regulation and perseverance
“Called for bioengineer (to theatre/operating room) consult”	Collaborative engagement → Emotional regulation and perseverance
“Asked consultant and/or surgical technologist for suggestions”	Collaborative engagement → Emotional regulation and perseverance