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The Effect of Tool Path Strategy on Surface and Dimension in High Speed Milling

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Abstract : Many orthopedic implants like proximal humerus cases require lower surface roughness and almost immediate/short lead time surgery. Thus, rapid response from the manufacturer is very crucial. Tool path strategy of milling process has a direct influence on the surface roughness and lead time of medical implant. High-speed milling as promised process would improve the machined surface quality, but conventional or super-abrasive grinding still required which imposes some drawbacks such as additional costs and time. Currently, many CAD/CAM software offers some different tool path strategies to milling free form surfaces. Nevertheless, the users must identify how to choose the strategies according to cutting tool geometry, geometry complexity, and their effects on the machined surface. This study investigates the effect of different tool path strategies for milling a proximal humerus head during finishing operation on stainless steel 316L. Experiments have been performed using MAHO MH700 S vertical milling machine and four machining strategies, namely, spiral outward, spiral inward, and radial as well as zig-zag. In all cases, the obtained surfaces were analyzed in terms of roughness and dimension accuracy compared with those obtained by simulation. The findings provide evidence that surface roughness, dimensional accuracy, and machining time have been affected by the considered tool path strategy.

Keywords : CAD/CAM software, milling, orthopedic implants, tool path strategy
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