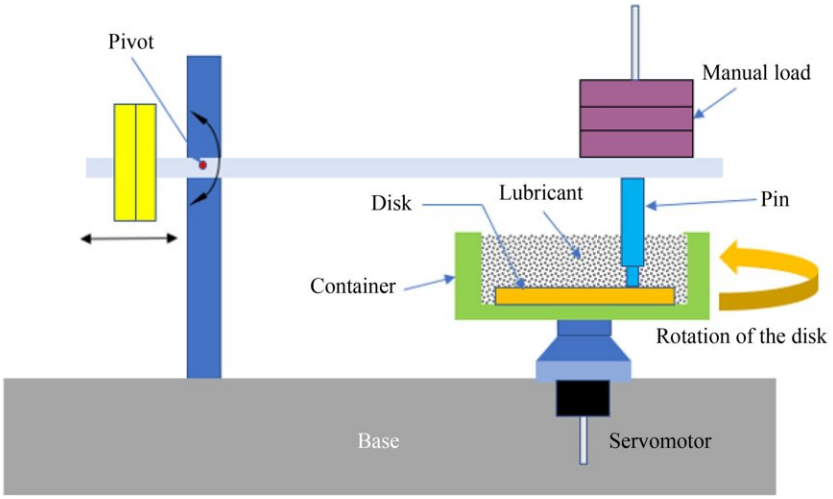
Surface modification for improving the in-vivo lifespan of bioimplants

August 25 2022



Credit: *Frontiers of Mechanical Engineering*. DOI: 10.1007/s11465-022-0682-6

Recently, researchers from University College Dublin have made some new development on increasing the in-vivo lifespan of artificial joints. The research team developed an optimized surface topography design for bioimplants, covering both surface roughness and surface textures, which is likely to help reduce the aseptic loosening induced by wear particles. This study can be found in the journal *Frontiers of Mechanical Engineering*.

As the world fast becomes and aging society, there will be a growing

need for bioimplants in the near future. However, the current artificial joints have a relatively short longevity, generally 15–20 years, which is obviously insufficient for younger patients. Under this circumstance, many patients have to take revision operations after taking the primary replacement. This will cause a huge burden to the health care system as well as a damage to the physical health of patients.

Since the main failure mechanism of current bioimplants is the bioactive reactions between live tissues and polymer debris, the research team focuses on finding the optimal surface roughness to improve the tribological performance of bearing surfaces under the simulated working condition.

In addition to the surface roughness, surface texturing is another effective method to improve the tribological performance. Conventionally, evenly-distributed micro patterns are discussed in the literature. However, unevenly-distributed micro patterns are often seen on the healthy natural joints.

There is still a lack of knowledge regarding which distribution mode is more suitable for the bioimplants and the mechanism behind them. Based on the comprehensive study, the primary finding confirms that the evenly-distributed mode is more suitable for artificial joints, and the second lubrication effect can explain this phenomenon. The researchers also proposed a specific micro-pattern design for the optimal tribological performance in previous works which underpins this research finding and valuable for guiding industrial practice.

More information: Gang Shen et al, Tribological study on the surface modification of metal-on-polymer bioimplants, *Frontiers of Mechanical Engineering* (2022). DOI: 10.1007/s11465-022-0682-6

Provided by Higher Education Press