بيانــات عـن البحــث السادس المقـدم للترقيــة

رقم البحث فى القائمة المعتمدة	٦				
عنوان البحث باللغة الانجليزية	**Efficient System Reliability-Based Design Optimization Study for Replaced Hip Prosthesis Using New Optimized Anisotropic Bone Formulations**				
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اسم المجلة + رقم المجلد و العدد + ISSN	**Materials**			**ISSN: 1996-1944**	
	Volume	**13**	**Issue**	**2**	
تصنيف المجلة	**Web of science**	**IF**	**Scopus**	**CiteScore**	
	Q2	**3.057**	**Q2**	**3.5**	
تاريخ النشر	**13 January, 2020.**				
هل البحث مشتق من رسالة علمية؟	لا البحث غير مشتق من رسالة علمية				

ملخص البحث باللغة الإنجليزية:

An efficient reliability algorithm is developed to transfer the system reliability problem to a single-component reliability problem, considering the uncertainty of loading cases and the material properties. The main difficulty is that femoral bone densities change after hip arthroplasty and, thus, the mechanical properties of the distinctive bone tissues and, therefore, the corresponding elasticity modulus and yield stress values change. Therefore, taking these changes into account during the hip prosthesis design process is strongly needed. As the bone possesses anisotropic behaviors, as the material properties in both radial and tangential directions in long bone (femur, tibia) are almost similar, the bone anisotropy is represented in this study by transversal isotropy. Two optimized formulations for yield stress against the elasticity modulus relationship are first developed and then integrated into an efficient reliability algorithm. Thus, a coupling between reliability and optimization, so-called reliability-based design optimization (RBDO), is introduced in order to control the reliability level. The proposed RBDO algorithm using optimum safety factors (OSF) takes into account the material uncertainties and leads to new stem dimensions. An in-depth numerical analysis on a cementless hip prosthesis is implemented to demonstrate the appropriateness of the proposed algorithm with the consideration of many different loading cases. The results show that the studied model can be effectively used when compared to previous works, which concerns the changes in both geometry and material properties.