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**A Comparative Evaluation of Flexural Strength of Titanium Alloy Bar
 Fabricated by Tungsten Inert Gas Welding and Electron Beam Welding –
 An Invitro Study**

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ABSTRACT:

AIMS AND OBJECTIVES: The purpose of this study was to determine whether Electron beam welding has any advantage over Tungsten inert gas welding in relation to flexural strength of titanium framework.

MATERIALS AND METHODOLOGY: For the purpose of this research study, the customized jig was fabricated for fixating and holding the dental material specimens consisting of rectangular steel platform of 35.19 x 9.04 mm dimension, two solid metal steel rectangular blocks of 10 x 10mm dimension each; built on top of the platform with the desired cavity to anchor the implants in place. The implants were fixed into these cavities and the abutments were screwed onto the implants. Grade -5 titanium bar of 15 x 3mm was welded to standard abutments of 3.75 x 12mm with metal thickness of 1mm and 2mm of all 4 groups using tungsten inert gas welding and electron beam welding. All 40 weld joints (20 units) were subjected to Three-point bend test using a Universal Testing Machine until failure and the results in the various groups were compared and statistically analyzed.

RESULTS: The mean flexural strength were as follows: Group 1: 938.79±0.39, Group 2: 2122.49±0.35, Group 3: 1635.15±0.59 and Group 4: 3001.57±0.48 respectively.

CONCLUSION: From the results of the study, it was found that in both TIG and EBW, there was significant increase in flexural strength when abutment thickness was increased, however the flexural strength remained superior in EBW compared to TIG irrespective of the abutment thickness. The SEM analysis also showed the presence of clear fusion line at the welded junction depicting a complete fusion of the titanium bar to the abutment since the welding was performed in a highly controlled clean environment. Hence both flexural strength and SEM analysis suggests that EBW is definitely superior than TIG welding.

Key words: TIG Tungsten inert gas welding, EBW Electron beam welding.

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