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Bone-cement interface strength in distal radii using two medullary canal preparation techniques: carbon dioxide jet cleaning versus syringed saline.

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PURPOSE: Loosening is an important cause of failure of upper limb arthroplasty and improvement in cementation techniques may limit this. The currently accepted medullary canal preparation techniques use saline washing and gauze drying. Another method of bone preparation uses carbon dioxide compression gas jet which blows debris from the canal, whilst simultaneously drying the bone. We compared the push out strengths of cement plugs in sections of human cadaveric radii that had been prepared using either syringed saline or carbon dioxide jet cleaning.

METHODS: Following bone preparation, four radii in each group, were cemented in a standardised fashion, and cut into 1 cm sections. An Instron materials testing machine was used to measure the force needed to push the cement plug out of the bone section.

RESULTS: The force needed to push out the cement plug was significantly higher in the carbon dioxide jet (median 580.61, IQR 429.10-650.05) as compared to the saline group (median 366.57N, IQR 271.05-502.23), P = 0.009. The mechanism of failure of the bone-cement interface also differed between the two groups, with 100% of the sectioned cortices fracturing prior to cement extrusion in the carbon dioxide jet group, but only 23% of the sectioned cortices doing so in the saline group.

CONCLUSION: Our results suggest that there is a statistically stronger macro-interlock at the bone-cement interface after preparation of the medullary canals of radii using a carbon dioxide compression gas jet as compared to saline irrigation.

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Fig. 1 Apparatus set-up with instrom machine used to push cement out of cortical sections.

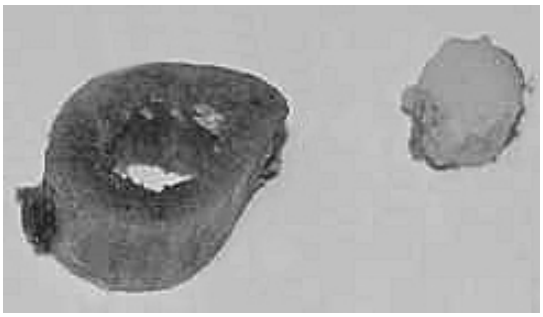

Fig. 2 Cement extrusion with an intact cortical rim. This mode of failure was seen in specimens prepared with saline irrigation.

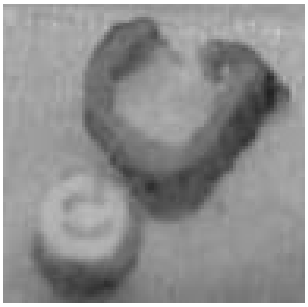

Fig. 3 Cement extrusion following fracture of the cortical rim. This mode of failure was seen mainly in those specimens prepared with carbon dioxide jet compression system.