

## SCIENTIFIC SECTION

# Commentaries on scientific papers published in this edition

### Effects of different brazing and welding methods on the fracture of various orthodontic joint configurations

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In a relatively short period, new joining techniques have become popular in the fabrication of orthodontic appliances, implants and fixed prostheses. Their uptake is increasing. Although new to dentistry, laser welding and tungsten inert gas (TIG) welding have been fully developed for engineering applications. They are used extensively in the aerospace industry to obtain strong joints consistently. The authors have measured and compared the strengths of conventional dental brazed, laser welded and TIG welded joints for a variety of orthodontic wire/wire and wire/band configurations. Surprisingly, very little has been published on this. This research provides valuable information for both orthodontist and technician.

It is normal to measure the strength of a welded joint by its tensile fracture stress, as is required in the ISO standard, now under development.<sup>1</sup> (In this standard the specimen is a small thin rectangular plate butt welded to a similar plate). However, in their research, the authors choose to use steel orthodontic wires and bands. (By selecting these subcomponents the authors reveal not only whether a joining technique has the potential to produce a strong joint, but also whether it can be produced when clinically relevant conditions are imposed). To determine the stress at failure is not feasible and the authors are correct to use failure force as the criterion. This imposes a limitation on comparisons. Since the areas of the joints differ with configuration, a comparison of failure force is appropriate only when the configuration is constant. We should not assume that the technique that produces the highest value for a particular configuration will necessarily do the same for all others – fracture mechanics may influence the outcome. Therefore, the authors are right to test a range of configurations. It is interesting to read that TIG welding produces strength twice that of laser welding for an end-to-end configuration, but the two sets of results are indistinguishable for other wire to wire configurations. If the highest strength is sought, the user should consider the configuration required and select the most appropriate technique. However, it is clear that

welding is greatly superior to brazing for joining wires. Only when a wire is being joined to a steel band does brazing produce comparable strength. While it is not within the scope of their experimental programme, the authors are right to remind us that the potential to form galvanic cells is far greater when brazing is selected.

Notwithstanding the end-to-end result, the overall superiority of laser welding is demonstrated clearly and this is the take-home message. Tungsten inert gas compares well, when it can be used. The restriction that rules out TIG welding to a band can be used to place it second. The capital cost of a laser welder might deter many technicians from moving away from the long time favourite, brazing. Nevertheless, significant technical advances always carry a price tag, and it is the cost of progress.

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### Reference

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### Qualitative study of orthognathic patients' perceptions of referral to a mental health professional: part 1—questionnaire development

**F. S. Ryan, S. J. Cunningham, J. A. Shute**

### Qualitative study of orthognathic patients' perceptions of referral to a mental health professional: part 2—a questionnaire study

**F. S. Ryan, S. J. Cunningham, J. A. Shute**

These papers will be of interest to many orthodontists in view of the increasing use of combined orthodontic and orthognathic surgical treatment of severe malocclusions that cannot be fully corrected using less complex treatment with fixed appliances alone. A recent study estimated that 250,000 patients in the UK have malocclusions severe enough to require orthognathic

treatment.<sup>1</sup> Most orthognathic patients seek treatment because of concerns about their dentofacial aesthetics. Although a study published more than 10 years ago reported that a large number of patients seeking a consultation for orthognathic treatment were experiencing psychological distress,<sup>2</sup> other studies have not concurred with this finding. There is much interest in the psychological aspects of orthognathic treatment, and for the clinician an important question is whether orthognathic treatment changes the psychological status of their patients. Surprisingly, a systematic review of previous studies that have investigated this question revealed there was in fact little evidence that orthognathic treatment improved psychological well-being.<sup>3</sup> This conclusion was somewhat unexpected in view of the relatively large number of patients who undergo orthognathic treatment.

It therefore still remains unclear whether orthognathic patients have significant psychological problems before treatment, and whether treatment produces psychological benefits. For the clinician it is also important to know whether providing psychological support for orthognathic patients would be beneficial. The two papers reported in this issue of the Journal of Orthodontics by Ryan *et al.* begin the process of answering this question. In their literature review, the authors comment that most orthognathic patients are well-adjusted psychologically. Most orthodontists and surgeons providing orthognathic treatment would probably agree with this. Nevertheless, in view of the often dramatic changes in dentofacial appearance which result from orthognathic treatment, it is suggested that patient counselling and support may be important in helping patients achieve the best satisfaction with their treatment. Interestingly however, the authors note that a previous study of UK orthodontists has found that they are often reluctant to help patients obtain professional psychological support and assessment because of concerns about their patients' reactions to the offer of referral to a psychologist or psychiatrist.

The two papers comprehensively describe the development and subsequent application of a questionnaire designed to explore some of the potential barriers to achieving psychological support for orthognathic patients. The first paper will be of particular interest to clinicians treating these patients as it reports some of the individual comments made by clinicians who were interviewed. Although clinicians reported that it would be beneficial for their patients to see a mental health professional, there were some concerns that the suggestion of such a referral might be harmful to their relationship with their patients. The second paper reports the findings when using the questionnaire for a

group of orthognathic patients. The main conclusion of this second paper is that clinicians' fears of patients reacting badly to a referral to a psychiatrist or psychologist are generally unfounded. Furthermore, the authors conclude that patients generally had a positive view of such a referral.

Although the findings of these studies will provide reassurance to orthodontists who refer or are considering referring patients to psychologists or psychiatrists, the potential benefits to patients of such referrals remain to be scientifically evaluated. Ideally this information would be obtained from well designed controlled clinical trials comparing patients receiving psychological assessment and support with patients not receiving such an intervention. The issues discussed above, and the absence of any widely accepted standardized psychological outcome measures for orthognathic patients, as well as the need to undertake long term psychological follow up of these patients, mean that these future studies may be some years away. However, the findings of the papers published here by Ryan and colleagues do indicate that the previously perceived resistance of patients to accept psychological support is unlikely to be a barrier in carrying out these future studies.

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## References

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3. Hunt OT, Johnston CD, Hepper PG, Burden DJ. The psychosocial impact of orthognathic surgery: a systematic review. *Am J Orthod Dentofacial Orthop* 2001; **120**: 490–97.

## Influence of patient head positioning on measured axial tooth inclination in panoramic radiography

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The Panoramic Radiograph is one of the many tools in the armamentarium of the orthodontist. One of its uses is in the assessment of root angulation. But is it an accurate tool? This paper examines the influence of errors in patient head positioning on the mesiodistal axial inclination (MDAI) of the teeth in panoramic radiography.

This was a laboratory-based study. The study design was interesting and utilized a skull apparatus mounted on a modified camera tripod thus allowing ease of accurate head positioning and the use of multiple radiographs. Wire struts were placed on the long axes of the teeth and the angulations of these teeth were measured to the horizontal plane of the film. The apparatus was initially radiographed in the ideal position, with Frankfurt plane horizontal, and then with the skull tipped superiorly and inferiorly. These radiographs were repeated on three more occasions as part of the error study.

The results show that, with only a 2-degree superior head tilt or 7-degree inferior head tilt, statistically significant differences in angulation of the maxillary and mandibular molars occurred. Only 2-degree superior or inferior head tilt resulted in statistically significant changes in tooth tip in the premolar region. This is particularly important as this radiograph is often used to assess root angulation in this common extraction site. A superior head tilt created distortions that caused the maxillary premolars and anterior teeth to have a more distal root tip on panoramic radiographic assessment, whereas an inferior head tilt created more mesial root tip. The exact opposite occurred in the lower arch where the roots were projected mesially with superior head tilt and more distally with inferior head tilt.

In brief, the panoramic radiograph has an extremely low margin of tolerance to assess MDAI if there is any

variance away from ideal head position. There are differences between upper and lower arches, due to the position of the dentition in the focal trough. These errors may be aggravated by different skeletal form and malocclusions. According to the authors, the panoramic radiograph may be inherently flawed anyway for use in root angulation assessment as recent CT studies showed the panoramic radiograph does not accurately depict tooth tip even in ideal head position. It is not looking good for the use of the panoramic radiograph in the assessment of root angulation! It is interesting to note that the American Board of Orthodontics still use panoramic radiographs for the evaluation of finished cases for board certification.

We are in a period of change in orthodontics from two-dimensional imaging (e.g. plain film radiography, photography) to three-dimensional imaging such as cone beam tomography and laser scanning. However, these tools are not always available for use due to accessibility and cost restraints. Therefore, this paper is timely to point out the benefits and short fallings of panoramic radiography. The authors do support the use of panoramic radiography as a diagnostic tool but recommend prudence with its use in assessment of axial tooth inclination.

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