

Tube shift or tube tilt? The terminology of dental radiography is heterogeneous relative to radiological convention

Andy WK Yeung *, BDS

Oral and Maxillofacial Radiology, Applied Oral Sciences, Faculty of Dentistry, The University of Hong Kong,
Sai Ying Pun, Hong Kong

* Corresponding author: ndyeung@hku.hk

Hong Kong Med J 2017;23:97–8

DOI: 10.12809/hkmj166085

Radiography and radiology are vital to the health care profession, offering many non-invasive radiographic techniques that provide detailed information about what underlies superficial skin. Radiographic findings combined with clinical information enable clinicians to make an accurate diagnosis. For two-dimensional radiographs, one easily notices that the direction/orientation is crucial and must not be mistaken. One example of a dichotomy in orientation is ‘radiological’ versus ‘neurological’ conventions. In dentistry, we routinely view images according to ‘radiological’ convention (‘right is left’), as if we are looking at the patient face-to-face. On the contrary, ‘neurological’ convention dictates that ‘right is right’, as commonly adopted for images from neuroimaging studies such as functional magnetic resonance imaging.¹ This dichotomy is so renowned that the images are usually labelled ‘radiological’ or ‘neurological’ convention when an article is interdisciplinary.²

Occasionally, medical radiographs are an eccentric projection instead of an orthoradial projection. In other words, the X-ray beam comes from an oblique direction. For example, when a sternoclavicular joint injury is suspected, radiologists may prescribe a serendipity view where the X-ray beam is ‘tilted 40 degrees cephalic off vertical’ in order to visualise the joint.^{3,4} To achieve the tilt, radiographers will shift/translate the whole tube head in a caudal direction, and then rotate the tube such that it points in a cephalic direction. It is easily recognised that the direction is ‘tube tilt’, instead of ‘tube shift’. This convention was established after Kitty Clark published the first edition of the famous textbook, *Clark’s positioning in radiography*, in 1939⁵ that has been widely used by students in the health care sector.⁶

Eccentric projections are also useful in dental radiography. In 1910, Charles Clark described the famous ‘Clark rule’ to employ eccentric projections, together with an orthoradial projection, to localise un-erupted teeth. Albert Richards simplified the procedure and renamed it the ‘buccal object rule.’⁷ In essence, the un-erupted tooth will move in an

opposite direction to the ‘tube shift’. This is also widely taught as the ‘tube shift technique’ and ‘SLOB (same side lingual, opposite side buccal) rule’.^{8,9}

In this scenario one recognises that dentists, in applying eccentric projections, respect the direction of ‘tube shift’ whereas medical radiologists and radiographers respect that of ‘tube tilt’. Confusion may potentially arise when such communications are interdisciplinary. When a radiographer takes the eccentric projected images for the prescribing dentist, they may have a different understanding of the prescription of ‘shift’, be it ‘mesial shift (equivalent to distal tilt)’ or ‘distal shift (equivalent to mesial tilt)’, especially when there is limited or no previous experience with dental radiography, such as the situation in Hong Kong.

For example, to plan for surgical extraction of an impacted upper right premolar tooth, a dentist may prescribe a periapical radiograph with orthoradial projection, and another one with ‘mesial shift’. If the impacted premolar appears to move mesially in the ‘shifted’ image, which is in the same direction as the tube shift, one can see that the impacted tooth is situated on the palatal side. If, however, the radiographer who takes the images has limited dental radiography knowledge, he/she may take the eccentric projection in the opposite direction (‘mesial tilt’). The prescribing dentist will then believe the image is ‘mesially shifted’ and that the impacted tooth moves distally, and is situated on the buccal side. This may lead to surgery being performed on the wrong side. The situation may be even more complicated if a medical radiologist is involved in diagnosis and treatment planning, such as in surgery to remove a deeply impacted tooth or to resect one root of an infected multi-rooted posterior tooth.

The above discussion highlights the heterogeneity of domain languages and conventions used by dentists and by medical doctors/radiographers. The former assumes that eccentric projections are taken according to their prescription that respects the direction of ‘shift’, but the latter may take or interpret the eccentric projection images with respect to the direction of ‘tilt’. Practitioners

and dental academic staff should be aware of this discrepancy and avoid misunderstanding of the prescription of radiographs. To minimise the risks, the concepts of ‘tube shift’ and ‘tube tilt’ should be explained and emphasised to radiology staff wherever there is frequent cross-collaboration between medicine and dentistry. Another way is to apply the ‘tube shift technique’ with two different imaging methods, for example, an occlusal view plus a panoramic view, instead of a pair of periapical films in ‘parallax’. As both occlusal and panoramic views can be taken using standardised procedures, it is unlikely anyone will misunderstand the direction of the X-ray. In addition, the risk of misunderstanding can be eliminated by the prescription of small-volume three-dimensional imaging such as cone-beam computed tomography, provided that it is available and suitable. In future, it may be beneficial to highlight such discrepancy in the terminology during undergraduate teaching of radiography or radiology.

References

1. Yeung AW, Tanabe HC, Suen JL, Goto TK. Taste intensity modulates effective connectivity from the insular cortex to the thalamus in humans. *Neuroimage* 2016;135:214-22.
2. Nagy Z, Lagercrantz H, Hutton C. Effects of preterm birth on cortical thickness measured in adolescence. *Cereb Cortex* 2011;21:300-6.
3. Carmichael KD, Longo A, Lick S, Swischuk L. Posterior sternoclavicular epiphyseal fracture-dislocation with delayed diagnosis. *Skeletal Radiol* 2006;35:608-12.
4. Whitley AS, Sloane C, Hoadley G, Moore AD. *Clark’s positioning in radiography*. 12th ed. Boca Raton, FL: CRC Press; 2005.
5. Clark KC. *Clark’s positioning in radiography*. St Louis, MO: Mosby; 1939.
6. Cherryman G. Clark’s positioning in radiography (twelfth edition). *Br Dent J* 2006;199:752.
7. Richards AG. The buccal object rule. *Dent Radiogr Photogr* 1980;53:37-56.
8. Whaites E, Drage N. *Essentials of dental radiography and radiology*. 5th ed. St Louis, MO: Elsevier; 2013.
9. White SC, Pharoah MJ. *Oral radiology: principles and interpretation*. 7th ed. St Louis, MO: Elsevier; 2014.