Routine Screening Radiography for Retained Wire Following Arch Bar Removal Is Not Indicated

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Purpose: To estimate the screening test value of routine radiography after arch bar wire removal by assessing the incidence of retained wires and the importance of their sequelae.

Materials and Methods: This was a retrospective medical record review. Records of arch bar removal procedures were examined and divided into those screened with radiography after removal (screen group) and those that were not screened (comparison group). The incidence of retained wire was calculated for each group. Study variables included wire-related radiographic or clinical findings.

Results: Records of 546 mandible fractures were reviewed; 95 met the study criteria. Most exclusions were due to lack of arch bars, missing postoperative radiographs, or insufficient postoperative documentation. Of the 55 records in the screen group, 1 wire was detected (2%); of the 40 records in the comparison group, 1 wire was detected (3%). The total incidence of retained wire findings was not statistically different between the 2 groups and there were no adverse wire-related sequelae reported by any of the 95 patients.

Conclusion: Because of the low incidence of retained wires and wire-related sequelae, routine imaging after wire removal is probably not an effective screening test for retained wire and should be limited to situations in which there is clinical suspicion of retained wire.

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A useful screening test is one that provides early detection of disease that, if left undetected, could become a serious problem.[1] To know whether a routine screening test is valid, the incidence of disease (retained wire in this case) and the disease's sequelae must be established.[1]

Arch bars are still in common use all over the world.[2] After arch bar wire removal, wire fragments that are unintentionally retained could cause problems. For this reason (and others described in the Discussion section), some surgeons routinely screen patients for retained wire using panoramic radiography, whereas others routinely do not. An informal polling of faculty surgeons affiliated with the Department of Oral and Maxillofacial Surgery at the Oregon Health & Science University (Portland, OR) showed variability among surgeons on this issue, even in the same department. This variability might be due to training, personal experiences, local standards of care, perceptions of risk, or risk management strategies. A PubMed search (using the terms *wire, arch bar, removal, retained, interdental*) and a focused bibliography search of related articles yielded no reports on the topic of retained arch bar wires.

To understand the value of routine radiography after arch bar removal, one must estimate the incidence of retained wires and understand what happens when these wires are not detected. Once this is accomplished, the potential benefits of routine screening radiography can be weighed against the costs of radiography and risks of radiation. This is a simple but important question because of the ubiquity of arch

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bars and the corresponding large number of screening radiographs taken globally, in addition to their cumulative cost and radiation dose. Screening radiography after arch bar removal can be justified if it reliably detects wires that otherwise would not be detected by the surgeon or the patient and if wires undetected by radiography regularly cause harm.

Materials and Methods

A retrospective review was conducted at a single academic medical center (Oregon Health & Science University). Owing to the retrospective nature of this study, it was granted an exemption in writing by the university's institutional review board committee (number 00007653). Oral and maxillofacial surgery department patient billing data from September 2005 through January 2012 were searched for *Current Procedural Terminology* codes related to mandibular fracture (802.20 through 802.29 and 802.30 through 802.39). From this cohort, records that included removal of an arch bar wired to at least 3 teeth were selected. These records were divided into a screen group, which included those with a screening radiograph after arch bar removal, and a comparison group, which included those with at least 1 documented clinical encounter after arch bar removal, but did not have a screening radiograph after arch bar removal. This additional encounter in the comparison group was included as assurance that the patient was not receiving care elsewhere or experiencing wire-related findings that they did not have the opportunity to report. The only type of screening radiograph used was the orthopantomogram (panoramic radiograph).

Data for the chart review were recorded and managed using the Research Electronic Data Capture database (REDCap) through the Oregon Clinical & Translational Research Institute. The independent variable was use of screening radiography. In the screen group (plus radiography), the dependent variable was the presence of a retained wire on a radiograph after arch bar removal. In the comparison group (no radiography), the dependent variable was the presence of retained wire finding at any later date. The outcome measurement was documentation of any retained wire-related finding, such as gingival problems, pain, purulence, or ingestion of wire or any related problem. Based on the incidence of retained wire in each group (and the seriousness of their sequelae), the potential efficacy and benefit of screening radiography after wire removal were estimated.

Results

Of 546 qualifying medical records that were investigated, 95 met the study criteria. Of these, 55 met the criteria for the screen group and 40 met the criteria for the comparison group (Table 1). Patient age ranged from 16 to 52 years.

Raw data are presented in Table 1. Of the 95 qualifying records, 2 total retained wires were detected (2%). In the screen group, 1 retained wire (2%) was detected in the gingiva on the screening radiograph after arch bar removal (Fig 1). In the comparison group, 1 retained wire (3%) was discovered by the patient at home several hours after wire removal and reported at the subsequent encounter. The difference between groups in wire-related findings (2 and 3%) was not meaningful in a study of this size. In addition, no wire-related clinical findings or adverse events were documented in the records of these 2 patients with retained wires or in any of the 95 patients who had arch bar removal.

In this study, the incidence of retained wire after arch bar removal (pretest probability) was low (2%) and there were no wire-related adverse sequelae. In the United States, panoramic radiography is a service that routinely costs more than $100 and exposes the patient to ionizing radiation. For these reasons, radiography after wire removal does not meet the criteria for an effective routine screening test that were outlined in the introduction.

Discussion

STUDY LIMITATIONS

This study was relatively small and its retrospective nature prohibits the authors from knowing whether most radiographs were taken because of clinical suspicion of a retained wire or as a routine practice principle. Nonetheless, the study was large enough to show that undetected retained wires are relatively uncommon and, as such, many radiographs would have to be taken to detect 1 wire that was not going to be detected otherwise and that even more would have to be taken to prevent 1 serious adverse wire-related outcome.

Table 1. TWO-BY-TWO TABLE FOR RADIOGRAPHIC SCREENING TEST AFTER ARCH BAR REMOVAL

	Outcome		
Screening	Wire Finding Present	Wire Finding Absent	Total
Screen group*	1	54	55
Comparison group†	1	39	40
Total	2	93	

* Patient records with a panoramic radiograph.

† Patient records with findings of retained wire but no radiograph.

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