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Lead X-Ray Vests: Pros and Cons in Dental Radiography and Patient Education on Radiographic Technology

Kayla D. Oakley
*Virginia Commonwealth University*

Emily Deker
*Virginia Commonwealth University*

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Lead X-Ray Vests: Pros and Cons in Dental Radiography and Patient Education on Radiographic Technology
Emily Deker, BS; Kayla Oakley, BA
Dental Hygiene Program, Department of General Practice, Virginia Commonwealth University

Abstract:
This review of literature used the following databases: PubMed and Google Scholar. Additionally, the sources used were to identify current research. "dental," "lead apron," "patient education," "radiography," and "dental radiation imaging." The studies reviewed used previously validated primary and secondary research. All articles in this review were published within the last five years. Librarians from the VCU Tompkins-McCaw library as well as staff from the VCU School of Dentistry Radiology Department were consulted.

Materials and Methods:
- Low levels of Environmental Radiation in Digital Panoramic and Cone Beam Technology make Lead Vests Unnecessary
  - Rottke et al. Panoramic Study: Absorbed Radiation Dose Mean with Lead Shield: 87.95 (µGy)
  - Absorbed Radiation Dose Mean without Lead Shield: 97.34 (µGy) (1).
  - Rottke et al. Cone Beam Study: Absorbed Radiation Dose Mean with Lead Shield: 754 µGy
  - Absorbed Radiation Dose Mean without Lead Shield: 749µGy (2).
- Rectangular Collimation is Better at Lessening Radiation Levels than Round Collimation
  - Shetty et al. Study: With rectangular radiation, radiation was reduced by 40-52% compared with circular collimation (3).
- Potential Hazards From Dental Lead Apron Use and the Necessity of Maintenance
  - Burns et al. Study: 63% of lead shields tested had detectable surface lead (4). 88% of lead aprons classified as in "bad condition" had high amounts of lead dust on their surfaces (4). 27% of lead aprons hung up by hangers had surface lead, versus aprons stored in drawers which had 67% testing positive for surface lead (4).
  - Shog et al. Study: There was no increase in lead exposure between employees who used lead aprons versus those who did not (5).
- Patient and Provider Education on Dental Radiography Exposure Needs to be Updated
  - Sharma et al. Study: Of the 1,000 adult male and female patients ages 20-70 who participated in this questionnaire, only 24.7% had prior knowledge about the process and equipment of the radiology examination they received (7).

Surface Lead was Found on...
- 27% of lead aprons hung up by hangers
- 67% of lead aprons stored in drawers

Results/Discussion:
- Lead X-ray vests have historically been used to prevent radiation exposure to patients during dental radiography. New technological advancements in some forms of dental radiography have made them unnecessary. Digital panoramic and cone-beam radiography emit lower levels of radiation because of advancements in radiation filtration (1,2). There is virtually no difference in radiation levels between patients wearing lead vests and those not wearing lead vests while undergoing these types of radiographic imaging (1,2).
- This reduction in radiation is the same for Rectangular Collimation Radiography, including systems that use film, phosphor storage plates (PSPs) and digital sensors for imaging (3); although it is still necessary to wear lead vests with round collimation radiography, rectangular collimators reduce radiation by almost half across the board (3) and do not require lead vests. Not only do lead vests not have beneficial effects with these kinds of radiography, they also, unfortunately, pose a possible lead exposure hazard if not cared for properly (4). This study was necessary because there is a lack of patient education on the subject of radiographic technology (5). It is important to inform patients on the advancements in radiation filtration technology to increase patient comfort and to offer the best care possible.

Introduction:
Radiographic imaging is a crucial step for providing accurate and appropriate dental diagnosis. Lead x-ray vests have historically been used to prevent radiation exposure to patients during dental radiography. New technological advancements in some forms of dental radiography have made them unnecessary. Digital panoramic and cone-beam radiography emit lower levels of radiation because of advancements in radiation filtration (1,2). There is virtually no difference in radiation levels between patients wearing lead vests and those not wearing lead vests while undergoing these types of radiographic imaging (1,2). This reduction in radiation is the same for Rectangular Collimation Radiography, including systems that use film, phosphor storage plates (PSPs) and digital sensors for imaging (3); although it is still necessary to wear lead vests with round collimation radiography, rectangular collimators reduce radiation by almost half across the board (3) and do not require lead vests. Not only do lead vests not have beneficial effects with these kinds of radiography, they also, unfortunately, pose a possible lead exposure hazard if not cared for properly (4). This study was necessary because there is a lack of patient education on the subject of radiographic technology (5). It is important to inform patients on the advancements in radiation filtration technology to increase patient comfort and to offer the best care possible.

Problem: There is a greater need to emphasize and educate patients and providers about radiologic advancements and patient exposure. The tradition of placing lead x-ray vests on patients for all radiographs is no longer a necessity. Without the explanation of why lead aprons are no longer needed, unnecessary steps for the provider and potential harm to the patient could be caused.

Methods: This review of literature was assembled by analyzing data from primary and secondary sources through online databases. The most recent research on the risks and benefits of the use of lead x-ray vests towards patients in the dental office was examined. Articles included in this review were published within the last five years.

Major Findings: Studies show the use of lead x-ray vests is widely obsolete with most new types of radiographic technology.

Conclusions: Collimation and new digital radiographic devices have dramatically decreased patient radiation exposure by limiting the beam to a confined space on the patient’s oral cavity. There is also a risk that vests may pose a lead exposure hazard if not taken care of properly. The general patient population is widely unaware of these advancements in x-ray technology and of the ineffectiveness of lead aprons.

References:

Conclusion:
Studies have shown the use of lead x-ray vests is no longer necessary in coordination with many of the new collimation and digital radiography devices. There remains a need for further studies to definitively prove lead x-ray vests may be harmful to patients. To inform the patient on these findings is an important aspect of patient care while conducting radiographic procedures.