



# Lead Shielding Effect on Scatter Radiation from Dental Radiographs

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## BACKGROUND

Though it has been the standard of care for decades, recent studies indicate lead shielding results in a negligible reduction of ionizing radiation to tissues during dental radiographs and cannot protect against internal scatter. Additionally, misplaced shielding could introduce artifacts into imagery, resulting in retakes and increased patient exposure [1] [2] [3]. These findings have resulted in updated guidance from prominent dental governance organizations, who now recommend discontinuing the use of lead shielding [4]. This study builds on these findings to evaluate radiation effects in the context of a pediatric-scale phantom.

## METHOD

A pediatric phantom head with mannequin torso was used to model the anatomy of a 10-year-old child. A .3mm lead equivalency thyroid collar and lead apron were used to test shielding effects. Dosimeters were placed to measure radiation at the chest, abdomen, gonads, and thyroid. The Planmeca Intra X-Ray unit was positioned for a right side bitewing. The average absorbed dose and effective dose were obtained to derive results and conclusions.

## RESULTS

The presence or absence of lead shielding was not statistically significant ( $p=0.288$ ). Nor was there a statistically significant interaction between dosimeter location and presence or absence of lead shielding ( $p=0.570$ ). Radiation was significantly higher in thyroid locations than in the abdomen, chest, and gonads ( $p<0.001$ ), and significantly higher in the superior left thyroid than the left thyroid ( $p<0.001$ ) and right thyroid ( $p=0.002$ ).

Table 1. Effect summary ANOVA.

Effect	Degrees of Freedom	Denominator DoF	F-Value	p-value
Location	5	20	118.38	<.001
Shield	1	4	1.50	0.288
Location*Shield	5	20	0.79	0.570

Table 2. Summary location comparisons, with and without shielding.

Radiation by location	p-value
Abdomen & Chest	0.065
Abdomen & Gonads	0.980
Abdomen < Thyroid Left	<.001
Abdomen < Thyroid Right	<.001
Abdomen < Thyroid Superior Left	<.001
Chest & Gonads	0.137
Chest < Thyroid Left	<.001
Chest < Thyroid Right	<.001
Chest < Thyroid Superior Left	<.001
Gonads < Thyroid Left	<.001
Gonads < Thyroid Right	<.001
Gonads < Thyroid Superior Left	<.001
Thyroid Left & Thyroid Right	0.195
Thyroid Left < Thyroid Superior Left	<.001
Thyroid Right < Thyroid Superior Left	0.002

## CONCLUSION

Recent studies conclude that radiation doses during bitewings pose minimal risk to adults. These studies have further highlighted the potential negative effects that can arise from shielding use. As a result, governing bodies are recommending practitioners forego the use of such equipment.

This study tests for and demonstrates the same conclusion for the pediatric patient population, indicating that observed radiation levels do not warrant the continued use of lead shielding in the pediatric population for bitewing x-rays.



Figure 1. Exposure without protective lead



Figure 2. Exposure with protective lead



Figure 3. 10mm between tube head and phantom

## REFERENCES

