

# Retrospective Review of Hall Crown Outcomes

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## BACKGROUND

Dr. Noma Hall began using what is now referred to as the “hall crown technique” in the late 1980s. This technique involves no mechanical preparation or removal of decay of the tooth prior to crown cementation. This means no local anesthetic is necessary during the procedure. This is advantageous in pre-cooperative children, families who have limited access to care, and families who have limited funds available to spend on expenses such as moderate sedation or general anesthesia. Eliminating negative dental experiences for children allows them to maintain regular dental care as adults. This can promote a healthy oral cavity and lessen the chance of systemic diseases such as cardiovascular diseases, diabetes mellitus, respiratory diseases, adverse pregnancy outcomes, Alzheimer’s disease, dementia, and cancer which all have an oral bacterial component. The aim of this study was to evaluate hall crown outcomes by recording presence or absence of pre-operative signs or symptoms, grading pre-operative radiographic lesions using the ICDAS grading scale, recording operative behavior scores as well as if nitrous oxide was used during seating, recording post operative signs or symptoms, recording total number of follow ups, evaluating whether the crown was fully seated and sealed the decay, and final outcomes for the restored tooth being either: natural exfoliation, extraction, or unknown (either being lost to follow-up or still in the patient’s mouth).

## Materials and Methods

A total of 750 crowns were placed. The data were subsetted for completeness. The data was then fit for a cox proportional hazards model with the outcome of crown failure, accounting for clustering via patient id. A final model was selected using AIC stepwise selection in both directions. Model fit was evaluated using Schoenfeld residuals. A second model was fit, using the same method as above, but only on teeth classified as D3 or P.

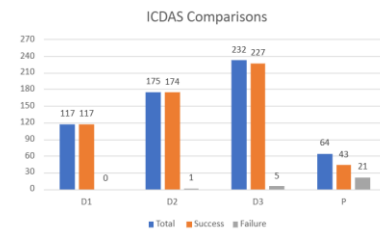
A cox proportional hazards model is a method of evaluating time-to-event data (in our case, time to crown failure). Covariates within that model modify the relationship between time and the event occurring. There is a cluster function included in the model that allows non-independence of data points (multiple teeth per participant).

## RESULTS

The full data model found that seal and P failure compared to D3 were the only variables that were statistically significant. Seal (HR: 0.107; 95% CI: 0.05, 0.229;  $p < 1e-8$ ). A crown with an intact seal has 0.107 times the probability of failure, compared to a crown without an intact seal. Because the value is less than one, the probability of failure is less in those with an intact seal. Definition of hazard rate: “instantaneous probability that a subject who has not experienced the event [crown failure] at time t will experience it in the next time interval divided by the length of time.” Hazard ratio modifies the hazard rate via multiplication. If there is a baseline hazard rate of 0.7, the hazard rate of a crown with an intact seal would be (hazard rate \* hazard ratio) = (0.7 \* 0.107).

Of the total 27 failures in our data, 18.5 percent are in the category D3, and 77.8 percent are in the category P. This is compared to the total percentage of D3 (failures and successes) of 37.8 percent and P of 13.6 percent.

For the dataset subsetted by ICDAS D3 and P, including only those with complete radiograph records. The final model included 627 crowns and included the variables behavior, seal, star, and ICDAS. Seal (HR: 0.2; 95% CI: 0.091, 0.441;  $p < 0.0001$ ), star (HR: 0.213; 95% CI: 0.071, 0.643;  $p = 0.006$ ), and ICDAS (HR: 17.593; 95% CI: 5.509, 56.179;  $p < 0.0001$ ). Differentiation between P and D3 had the largest effect size, indicating a large influence on likelihood of crown failure. As compared to a D3 tooth, a P tooth has 17.6 times the probability of failure.



| LFU: Is the crown seated well? | Failure    | Not Failure | Overall     |
|--------------------------------|------------|-------------|-------------|
| Not Seated                     | 3 (11.1%)  | 74 (12.3%)  | 77 (12.3%)  |
| Seated                         | 24 (88.9%) | 526 (87.7%) | 550 (87.7%) |
| LFU: Is there a good seal?     | Failure    | Not Failure | Overall     |
| Not Sealed                     | 17 (63.0%) | 76 (12.7%)  | 93 (14.8%)  |
| Sealed                         | 10 (37.0%) | 524 (87.3%) | 534 (85.2%) |

| Age at Treatment (years)     | Column1           | Column2           | Column3           |
|------------------------------|-------------------|-------------------|-------------------|
| Mean (SD)                    | 6.39 (1.91)       | 6.35 (1.57)       | 6.39 (1.88)       |
| Median [Min, Max]            | 6.00 [2.00, 16.0] | 6.00 [4.00, 9.00] | 6.00 [2.00, 16.0] |
| Age of Crown at LFU (months) | Column1           | Column2           | Column3           |
| Mean (SD)                    | 15.6 (10.8)       | 21.8 (12.1)       | 21.6 (12.1)       |
| Median [Min, Max]            | 13.0 [2.00, 48.0] | 19.0 [0, 54.0]    | 19.0 [0, 54.0]    |

## CONCLUSIONS

The outcome of this study showed significant results supporting hall crown success when the decay was fully sealed by the stainless steel crown. This study showed high success rates for carious lesions without clinical or radiographic signs of infection. This study shows that when hall crowns fail, they fail early on post cementation of the crown. Hall crowns are a great treatment option for uncooperative and cooperative patients. Hall crowns are shown to have an increased predictability of success if there is: an absence of pre-operative signs and symptoms, a pre-operative diagnostic radiograph showing at least the furcation of the tooth, the decay is not pulpally involved radiographically, and seating the crown so it can fully seal out the decay.

Although there is an increased risk of failure for pulpally involved carious lesions and hall crowns that do not completely seal the decay, hall crowns are shown to have high success rates and should be considered when treating all carious primary molars.

## REFERENCES

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## ACKNOWLEDGMENTS

I would like to thank Dr. Kahl for his insight in this study as well as Dr. Pankratz for allowing us to collect the data at his office. I would like to thank Angela Yoder for her assistance and expertise in analyzing the collected data. Finally, I would like to especially thank my faculty mentor Dr. Marinucci-Vinyard for her guidance and support throughout this process. This project could not have been completed without her dedication and brilliant mind.