murine models and assessment on human saliva samples and human pulpal cells collected from clinical samples. METHODS/STUDY POPULATION: In vitro antibacterial studies were performed by collecting and culturing human salivary bacteria with AHA substrates and quantifying survival of cariogenic Sm (S. mutans). In vivo, C57BL/6 mice were treated with AHA composite fillings, infected with Sm clinical isolates, and fed a high sucrose diet with cavity formation assessment after 6 weeks. To evaluate regeneration, mice were similarly given composite with AHA or MTA (standard of care) upon pulpal exposure with regeneration quantified by microCT and histological analysis of dentin bridge formation, ALP production, and odontoblast migration. In vitro, AHA substrates were cultured with MC3T3-E1 pre-osteoblast cells and dental pulp stem cells obtained from clinical samples over 21 days, with mineralization and ALP assessed indicating osteogenesis. RESULTS/ANTICIPATED RESULTS: In vivo studies have shown the reduction of cavity formation in mice treated with AHA as well as dentin regeneration upon pulpal exposure using microCT and histological image analysis. Coinciding with these findings, AHA substrates eradicated cariogenic Sm in human saliva samples and single species cultures in vitro. Further, preliminary results in vitro have shown increased mineralization of MC3T3-E1 cells when cultured with AHA substrates in comparison to uncoated substrates. We anticipate similar increased mineralization as well as increased ALP production of human pulpal stem cells from clinical samples when cultured with AHA substrates, suggesting osteogenesis. Further, we anticipate increased odontoblast migration and ALP production upon additional analysis of in vivo tissue samples. DISCUSSION/SIGNIFICANCE: This work will elucidate the antibacterial and regenerative properties of AHA dental coatings. These results further support the translation of AHA coatings into the clinic as a novel therapeutic for the prevention and treatment of dental decay, which may overcome the limitations associated with the current treatments.

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Let Kids Play: Using Virtual Reality as a Substitute for General Anesthesia for Minor Procedures in Children

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OBJECTIVES/GOALS: Minor procedures are anxiety-provoking and/or painful for children. Virtual reality (VR) is an emerging technology in medicine and largely has been used as an adjunct to analgesia and opioids. This study reviews the institutional use of VR in lieu of pharmacology and general anesthesia (GA) to perform minor procedures in a pediatric population. METHODS/STUDY POPULATION: A retrospective chart review was performed on all patients that presented to our institution from 2019 to 2022 for hormone implant placement, exchange, or removal with VR distraction. Demographic and procedure information was recorded. The primary outcome was successful procedure completion without requiring pharmacologic sedation or analgesia. RESULTS/ANTICIPATED RESULTS: A total of 111 patients underwent the following minor procedures with VR only. 14 patients underwent more than one procedure resulting in a total of 126 procedures. The mean age was 11.3 ± 3.6 years. 43 patients were female, 23 were female to male, 6 were non-binary, 7 were male, and 32 were male to female. 58% had private insurance. The most common diagnosis was precocious puberty (54%) followed by gender dysphoria (46%). The most common procedure was implant placement (72%). 69% of procedures were performed in the clinic and 31% in a procedural room. All procedures were completed without requiring sedation or GA. None of the patients required intravenous catheter placement for the procedure. No intra-procedural complications were recorded. DISCUSSION/SIGNIFICANCE: Despite the current trend toward minimizing GA and sedation in children, there is no widely accepted substitute. VR is a feasible option that can spare children from sedation or GA for minor procedures. This can enable procedures to be transitioned into more resource efficient settings and improve pediatric patient experience.

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Leveraging multi-timepoint blood samples to characterize cancer-associated mutations in the blood over time

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OBJECTIVES/GOALS: Clonal hematopoiesis of indeterminate potential (CHIP) is a common age-related condition that confers an increased risk of blood cancer, cardiovascular disease, and overall mortality. Larger proportions of blood cells with the CHIP mutation (clones) lead to worse outcomes. The goal of this study was to characterize CHIP clonal behavior over time. METHODS/STUDY POPULATION: While DNA biobanks have the ability to identify large cohorts of individuals with CHIP, they typically only contain blood from a single timepoint, limiting the ability to infer how CHIP clones change over time. In this preliminary study, we utilized multi-timepoint blood samples from 101 individuals with CHIP in Vanderbilt's biobank (BioVU) to characterize clonal behavior over time. Using a CHIP gene-specific sequencing pipeline, we were able to characterize each individual's CHIP mutation(s) and how the fraction of cells with the CHIP mutation expanded/reduced over time. By Spring 2023, we will also include ~300 additional individuals with CHIP in this study. RESULTS/ANTICIPATED RESULTS: CHIP mutations occurred 48% of the time in DNMT3A and 23% of the time in TET2, consistent with previous studies. 21% of individuals had more than one CHIP mutation. The mean difference in time between the two timepoints was 5.2 years (SD=2.9). Surprisingly, we observed both clonal expansion and clonal reduction across timepoints with 30% of DNMT3A, 0.6% of TET2, and 46% of JAK2 clones shrinking over time. The fastest average expansion was seen in TET2 clones (2% growth/year) and the slowest in DNMT3A clones (0.4% growth/year), but there was a significant amount of variation between individuals. In DNMT3A clones, there were no differences observed between loss of function mutations, missense mutations or DNMT3A R882 hotspot mutations. Clonal competition was observed in individuals with multiple driver mutations. DISCUSSION/SIGNIFICANCE: We used multi-timepoint blood samples to quantify the change in CHIP cell fraction over time on a per individual basis and observed novel clonal behavior and competition. Understanding the factors that influence the rate of CHIP progression can lead to personalized disease risk assessment for individuals with CHIP.

https://doi.org/10.1017/cts.2023.358