Objectives: This research evaluated tooth whitening on the treated maxillary teeth and untreated mandibular teeth to assess the feasibility of split arch study model. Methods: Twenty healthy adults with no history of vital bleaching were assigned twice daily use of 6% hydrogen peroxide whitening strips over 14-days, while the mandibular arch remained untreated. Digital images of the anterior teeth were collected at baseline, intermediate Day 8, and end-of-treatment Day 15 using a high resolution digital camera and fixed lighting conditions. From each image, $L^*a^*b^*$ color was determined separately for the maxillary and mandibular anterior teeth using calibration standards. A repeated measures model was used to compare arches, and intra-class correlations (ICC) and 95% confidence intervals (95% CI) were derived for tooth color on the untreated lower teeth. Results: The study population ranged from 19-59 years of age. On the treated maxillary arch, mean (SE) $\Delta b^*$ yellowness was $-1.3$ (0.15) at Day 8 and $-2.2$ (0.24) at Day 15, differing significantly ($p < 0.0001$) from baseline and the untreated mandibular arch at each timepoint. The untreated mandibular arch showed no significant ($p > 0.53$) color change, with mean (SE) $\Delta b^*$ of $0.0$ (0.07) and $0.1$ (0.11) at Day 8 or Day 15. Outcomes were similar for $\Delta L^*$ brightness. On the untreated mandibular arch, the overall between visit ICC (3 visits) was 0.973 for $b^*$ and 0.968 for $L^*$. 95% CI lower bounds for the between visit ICC of $b^*$ and $L^*$ ranged from 0.942-0.951. Conclusion: The absence of color change on the untreated arch, combined with consistent digital image measurement over time, suggests the viability of a split arch model using untreated mandibular teeth as an experimental control in tooth whitening trials.