

Spent two of the days at Sun River, Oregon, with the Marshall endo study club listening to M. Torabinejad. Among other things he talked about MTA and MTAD, and showed the research behind it. As Joey D has stated, MTAD is a combination of doxycycline, citric acid and tween 80. At different times he described tween 80 as a food additive and as a detergent. The liquid is removed in the manufacturing process, to give it a longer shelf life, so it comes as a powder. You add liquid at the time of use. The citric acid removes the smear layer, the tween 80 acts as a surfactant to provide effective wetting and penetration into the tubules, and the TCN binds to the calcium and provided substantivity and ongoing antimicrobial effects. He showed a series of microbiology studies, starting from simple to complex, that they used to determine it's effectiveness and figure out the best way to use it. They tested various different protocols and found it is most effective as a 5 minute soak after cleaning and shaping is complete with SH. It is not as effective as SH during instrumentation at getting the canal walls clean. They consistently got no growth in the SH/MTAD groups. His conclusion was that this allows nearly all teeth to be treated in one step. One other interesting finding was that you could dilute the SH 1:4 and still get the same results.

There were two aspects of the studies that could be questioned. First, they compared SH/MTAD to SH during instrumentation and then a 17% EDTA soak, but not SH/EDTA followed by a soak with SH. They hit every other conceivable combination. When I see an obvious comparison group skipped, it makes me wonder if the group was tested but the results not reported. I can't imagine someone of Torabinejad's stature would do that, however. Also, all the tests were conducted with *E. faecalis*. It is obvious why they did that, but you can't really extrapolate and say the results would be the same with the usual combination of organisms in an infected root canal.

He talked half a day on MTA, and said a few things I hadn't heard before. There are 21 formulations for Portland cement, and they tested them all. They had to remove things like arsenic and lead, and fiddle with the formulations to come up with the most biocompatible material and the best physical properties. The new white MTA is the old MTA with the iron oxide removed. It hasn't really been tested, so it is not known if it behaves the same as the gray MTA. For this reason he convinced TDP to put the gray version back on the market. He showed a bunch of histology comparing MTA to CaOH. I never understood why you would use MTA for direct pulp caps or Cvek pulpotomies, but I do now. He showed dentin bridging that was much better and more consistent in both cases with MTA. In addition, in Cvek pulpotomies, he said the dentin walls develop at a normal rate, so you don't have to worry about whether to do a root canal before the canals disappear. He showed several 5 year follow-ups that supported this. He also said apexification was more consistent with MTA and showed a number of successful cases. He also said that if you extrude the MTA past the apex you end up with a longer tooth, because the root develops around it. He said you should not use collagen barriers, because to get cementum to grow over it the MTA must be in contact with the bone. He said Kim repeated many of his studies and got the same results. He said MTA has a pH of about 12.7 which gives it good antimicrobial properties, and that it has 0.5% setting expansion, and that is why it provides such an effective seal.

For developing MTA he received a \$2.5 million contribution to the AAE foundation. TDP also supported the research that went into development and FDA approval. Loma Linda currently receives royalties from the sales of MTA, but he receives nothing. He has a similar deal with MTAD. He said so far the FDA is giving them a harder time with MTAD than they did with MTA.

It is always interesting to be with someone like Torabinejad in a small group where you can ask questions one on one. It allows you to really get into the nuances of technique.