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Commentary by Majinah Ahmad
Ahmad M, Pitt Ford TR, Crum LA, Walton AJ (1988) Ultrasonic debridement of root canals: acoustic cavitation and its relevance. *Journal of Endodontics* 14, 486–93

When I was asked to write about my collaborative work with Tom Pitt Ford, I considered it to be an overwhelming responsibility. This tribute can be a personal look at a life, a defining statement about the person whom I have known, worked and cherished. Being his first postgraduate student, I was as eager as he was to see a successful outcome of the research project. Despite his numerous responsibilities, Tom gave his time, enthusiasm and showed great keenness during many illuminating discussions we had from 1984 until 1988.

In the 1980s, considerable emphasis was placed on canal debridement on the notion that a clean canal greatly contributed and enhanced the high success rate of root canal treatment. In view of this, several cleaning devices were introduced into the market; one such instrument that gained much acceptance employed flow-through irrigation in combination with ultrasonics.

In 1982, a concept known as 'cavitation' was introduced into Endodontics by H. Martin and W. Cunningham. 'Cavitation' is defined as implosion of vapour-filled cavities in the irrigation liquid due to changes in pressure when the ultrasonic file vibrated. Claims were made that the physical phenomena of 'cavitation' could be generated by the ultrasonic instrument when used to clean the root canals that could contribute to very clean canals. Unfortunately, these claims had not been substantiated by independent scientific evidence and testing.

In 1984, when Tom Pitt Ford suggested that these claims should be investigated, I considered it to be a daunting task: a good knowledge of basic physical principles was needed. But through close collaboration with two physical scientists, namely, L.A. Crum and A.J. Walton, some light was thrown into the cavitation phenomenon presumed to be generated by this ultrasonic instrument. Using sensitive image intensifier equipment, the phenomena of cavitation was investigated via light detection. The results of the experiment showed that although cavitation could be produced by the ultrasonic instrument *in vitro*, it could only be generated when the file was freely vibrated in the root canal at a displacement amplitude that was clinically unrealistic. At such an amplitude opportunity for breakage was high. Furthermore, we discovered that the anatomical constraints posed by the narrow and curved canals *in vivo* would dampen the displacement amplitude required for cavitation inception. It was interesting to note that in large straight canals when the displacement amplitude of the file was not dampened, cavitation could be produced; however, this phenomenon generated the formation of pits sparsely distributed at the apical end of the canal but failed to remove smear layer. This study therefore dispelled the popular view that cavitation would always occur during actual clinical procedures. When cavitation occurred, it contributed little to the cleaning of the root canal so critical in clinical practice, although in general, canals prepared by ultrasonic instruments were found to be generally cleaner – possibly via different mechanisms such as acoustic streaming. The results of our studies generated further curiosity as to the mechanisms involved in ultrasonic debridement and formed a basis of further experiments cited in papers subsequently published by the authors and others. With the guidance of Tom Pitt Ford, a new body of knowledge was thus presented to the field of Endodontics.

Tom Pitt Ford was a person of few words and was kind at heart. He had an enthusiastic spirit, was a likeable person with a good disposition. Throughout my collaboration with Tom, I found him to be an excellent professional teacher and a dedicated researcher with a clear enquiring mind. Without doubt, his curiosity and thirst for knowledge had provided a great contribution to the science of Endodontics.