

Origin and evolution Harold D. Kesling in 1945, first advocated the use of rubber-based tooth positioners, fabricated from wax setups of patient's dentition, and demonstrated that these appliances not only helped in detailing orthodontically treated cases but could also sequentially reposition misaligned teeth, thereby pioneering the fundamental concepts of modern CAT with the possibility of performing significant orthodontic tooth movements with thermoplastic materials [11]. In 1971, Ponitz utilized Biocryl (polymethyl methacrylate), which was made out of cellulose acetate butyrate, polyurethane (PU), polyvinyl acetate–polyethylene polymer, polycarbonate–cycloac, and latex, to introduce an 'Invisible retainer'. This vacuum-formed clear plastic appliance was initially fabricated for finishing and retention of orthodontic cases using base plate wax on the prepositioned cast and could obtain limited orthodontic tooth movements, chiefly by tipping crowns and could be used for subsequent retention [14]. A variety of thermoplastic materials, including acetates, vinyl, styrene, polyethylene, and butyrate sheets could then be vacuum formed over the designed cast to fabricate a dental contour appliance that could move teeth. In 1985, McNamara [15] modified Ponitz's technique and used 1 mm thick Biocryl(TM) polymers with a Biostar vacuum forming machine to fabricate invisible retainers for retention and final detailing. This technique involved the fabrication of a plaster cast on which rotated anterior teeth were sectioned from the cast using a fissure bur or a goldsmith's saw and the sectioned teeth were then re-arranged with wax on the cast as per the desired outcome. Kesling foresaw that more ambitious tooth movements could be realized with a series of aligners while recognizing the limitations of the technology available to him at that time: 'Major tooth movements could be accomplished with a series of positioners by changing the teeth on the set-up slightly as treatment progresses. Henry Nahoum in 1964 [13], then refined Kesling's technique by developing a vacuum-based appliance that displayed firm adaptation to a patient's cast. The difference between the Biostar machine and the previous vacuum former was that it used positive air pressure to adapt the thermoplastic Biocryl(TM) to the surface of the model rather than the vacuum pressure. Historical perspective 2.1