OBJECTIVES:

The aim was to study dimensional time-dependence of resin/ionomer formulations from 5 min age to one month and to separate out the intrinsic setting shrinkage and hygroscopic expansion effects, by using non-aqueous and aqueous storage media, respectively.

METHODS:

Materials studied included: A: resin-, B: metal- and C: polyphosphonate-modified glass-ionomer cements [GICs]; and controls of D: poly-acid modified composite [compomer]; and E: resin-composite. Separate specimen groups (n = 5) were stored in different storage-media: (i) silicone fluid; (ii) de-ionized water. Experiments were repeated at 23 and 37 degrees C. Volumetric changes of specimens (4 mm diameter x 6 mm height) were obtained via accurate mass measurements (to 10(-4) g), using Archimedes principle, with silicone or water also used as the Archimedean fluid. These measurements were made periodically over a 30 day period, post fabrication.

RESULTS:

In silicone at 23 degrees C, all materials underwent further gradual intrinsic shrinkage (after 5 min from mix). This was highly significant ($p < 0.05$) for the RM-GIC (A). At 37 degrees C, however the RM-GIC expanded, indicating that its cure is temperature-sensitive. In water, at 23 and 37 degrees C, the shrinkage was either partially offset (materials C, D, E), or replaced by appreciable expansions (materials A and B). Differences between RM-GIC (A) and MM-GIC (B) were significant ($p < 0.05$).

SIGNIFICANCE:

The deployment of dual storage media made an important contribution to the separate analysis of the volumetric changes due to the on-going setting chemistry in these systems and the time-dependent effects of an aqueous environment.