THE INFLUENCE OF PUNCH TOLERANCE ON CAPPING

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Capping is a problem that is often encountered during tablet formulation and manufacture. It has been ascribed to either the deformational properties of the material (Ritter and Sucker 1980) or to the presence of entrapped air within the interstices of the tablet during compression (Long and Alderton 1960). Ritter and Sucker (1980) reported that use of faulty or badly matched tooling has also been associated with capping. The present work investigates the influence of punch and die tolerance on the capping behaviour of three formulations at several compression speeds.

The compression properties of three formulations, prepared by conventional wet granulation techniques, were studied using the ICI High Speed Compression Simulator (Hunter et al 1976) which had been set up to simulate the action of a Manesty Rotapress Mark II 45 station tablet press running at various speeds in the range 600–5,000 tablets per minute. The punch tolerance was altered by installing three punch and die sets manufactured by I Hollands (Long Eaton, Notts.) to tolerances commonly used by Pharmaceutical tooling manufacturers. The air gap between punch tip and die wall for each set was found to be 10.5, 15, and 36.5 μm respectively.

A diametral breaking strength/compression pressure profile was obtained for each formulation and the compression pressure at which capping occurred was determined. Repeat runs were carried out in which the compression speed and punch tolerance were changed independently.

The data obtained for all materials indicate that, for a particular compression speed, as the punch tolerance is reduced the capping pressure decreases (see Table 1). In addition, as compression speed is altered independently of punch tolerance, the capping pressure decreases with increasing compression speed. The reduction in capping pressure with decreasing punch tolerance is greater at higher compression speeds. The influence of formulation was found to be less significant. However, the decrease in capping pressure with the reduction in the punch tolerance can be related to the initial granule bed porosity.

It is possible that the trends observed may be attributed to the rate of release of air from the granule bed during compression. If the rate of release of air is restricted by reducing punch tolerance or increasing compression speed, the capping pressure is reduced. Likewise, the presence of a larger proportion of air in the granule bed i.e. a high granule porosity, results in a reduction in the capping pressure. It would appear from these results that the presence of entrapped air is an important factor in capping.

Table 1. The capping pressure (MPa) for three formulations and three punch tolerances at 2500 tablets/minute.

Formulation \ Air Gap	10.5 μm	15 μm	36.5 μm
A	282	294	427
B	382	395	549
C	21	24	130

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