Positive identification of torn burned matches with emphasis on crosscut and torn fiber comparisons

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Abstract

Torn paper match examinations are one of the important types of examinations made by the Document Section of the FBI Laboratory and are probably some of the least heard about and least publicized examinations made by this laboratory. These examinations have often been extremely important and conclusive, particularly in investigations involving arson on both federal and nonfederal properties, espionage, burglary and breaking and entering, as well as in at least one prison escape case.

This paper will delineate the basic conditions of identifying torn burned matches with a matchbook, and in particular a method whereby positive identifications can be effected entirely by what will be referred to as crosscut and torn fiber comparisons. It will describe two elements of comparison that, to the author's knowledge, have not been previously used in torn match identifications. These elements require high magnification examinations of crosscut and torn fibers and foreign bodies embedded in the paper matrix, called inclusions, which, when properly interpreted, will allow positive identifications where other elements of comparison are inconclusive. This method in theory is basically a simple side-by-side comparison procedure, as are most all other crime laboratory comparisons. However, in practice, it is a very painstaking, time-consuming, and difficult comparison method, requiring extreme caution.
Type I tears, or concentric tears, are characterized by rupture of the transverse fibers connecting adjacent lamellae in the annulus, without disruption of the longitudinal fibers. These tears were not seen on MR images. Type II tears, or radial tears, are fissures extending from the periphery of the annulus to the nucleus, with disruption of the longitudinal fibers, appearing as hyperintense foci on T2-weighted images. Yu S, Haughton VM, Sether LA, Wagner M. Comparison of MR and discography in detecting radial tears of the anulus: a postmortem study. AJNR Am J Neuroradiol 1989;10:1077–1081. Abstract/FREE Full Text. Tear fluid serves several functions. The primary role of tear fluid is to provide the cornea with a surface of high optical quality and maintain the well-being of the corneal and conjunctival epithelium. The secondary function of tear fluid is to lubricate the eyelids during blinking. An important ongoing and future focus of tear- and meibum film-associated biomolecule research is the measurement and identification of disease state biomarkers [28]. To date, there are a number of tear fluid- and meibum-associated lipids and proteins that have been identified as possible disease-related biomarkers. Patients with dry eye typically report discomfort, burning, irritation, photophobia, and blurred vision and have an elevated risk of corneal infection and irreversible tissue damage [43].