Recent initiatives in the delivery of radiotherapy using multiple beam angles have shown improved dose conformance, at a cost of increase in time and complexity of treatment delivery. The use of computer-controlled linear accelerators and database integration between treatment planning and delivery makes automated treatment of patients technically feasible, however valid concerns exist about the safety of treatment delivery involving automated machine movements. In order to explore the issues involved with safe treatment of multiple fields, we have developed quality assurance procedures to permit automated treatment under the supervision of physics personnel. Key features in the process include planning of treatment delivery (beam order), establishment of a range of allowed table positions (based on immobilization devices indexed to the treatment couch, and simulation of the treatment), addition of extra monitoring equipment, and treatment at extended source-to-axis distances. This process has been used to successfully treat 80 stereotactic radiosurgery patients, using 11 to 20 beams per patient, in an average treatment delivery time of 25 minutes (as opposed to 45 minutes when treated manually). This process has recently been applied to fractionated treatments in the brain and abdomen, using up to 11 beams per fraction. Initial results indicate a typical time saving of 7 minutes per fraction over conventional treatment. The quality assurance issues learned through the supervised process are used as feedback to modify the treatment control system, as well as treatment planning.

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