Purpose: Irradiation of total scalp with conventional photon/electron fields has been challenging. The unique target shape adds complexity to the beam setup and poses difficulties in achieving a homogeneous plan. Patient setup can be cumbersome and time consuming. IMRT provides excellent dose distributions and simplifies the process of field boundary matching; however beam delivery time is still long due to large number of fields. VMAT has the capability to deliver a homogeneous dose with reduced set-up and treatment time. VMAT will be compared to other techniques in this work.

Methods: Seven patients have been planned for total scalp irradiation using conventional photon/electron planning, IMRT, and SmartArc VMAT. After optimized plans have been achieved using Pinnacle3 planning system, dosimetric comparisons were made between different methods on each patient.

Results: Compared with conventional therapy, both IMRT and VMAT yield more homogeneous plan on all the patients. V100% target coverage can easily increase to 98% or higher from approximately 75%. Maximum dose reduces to less than 108% of prescribed dose from 150%. The conventional method performs better in protecting critical organs. However, brain volume at D50%, maximum and mean doses to the cord and brainstem can all be reduced by more than 50% compared to IMRT and VMAT. As a comparison between VMAT and IMRT, in all the cases, IMRT plans are slightly more uniform, while VMAT generally demonstrates better critical organ protection. Different dose levels can be easily achieved without boost using IMRT or VMAT. An added bonus of VMAT is shortened beam delivery time, which is 2.5 minutes at maximum with double arc.

Conclusions: VMAT offers a viable alternative to conventional techniques in treatment of the total scalp. Advantages are improved dose distributions to the target volumes compared to conventional, and shorter treatment times compared to IMRT.