Purpose:
To report changes of cone beam properties when opened jaw field sizes were incorrectly set larger than the cone beam limiting device and to show the unintended dose to normal tissues resulting from the error in Linac-based non-coplanar arc treatment.

Methods:
The Monte Carlo code, BEAMnrc, was used to simulate the entire Linac head and circular cone beam limiting device accessory of a 6 MV beam. In addition to the correct jaw size of 5cm×5cm, two incorrect jaw sizes, 10cm×10cm and 20cm×20cm are simulated. The simulated beams were stored in phase-space files and were analyzed to obtain the beam properties. The beams were then used to calculate dose to patient based on CT images resulting from non-coplanar arcs. For the same circular cones, the dose to both target and the normal tissues were compared between using correct jaw settings and incorrect ones.

Results:
When the jaw sizes are larger than the cone beam limiting device, significant photon fluence at off-axis distances greater than 5cm was confirmed using film measurements. Monte Carlo dose calculations for a representative patient using a 10 mm BrainLab cone arc plan resulted in a small dose increase within the regions of less than 5cm radius and a large dose increase (20% of dose to the target) for the regions at distance greater than 5cm up to the field size of 20cm×20cm set by jaws. For 20 Gy tumor dose, this jaw size error may result in 4 Gy of unintended dose to normal tissues at distance greater than 5 cm away from the isocenter.

Conclusions:
The unintended doses to normal tissues are significant due to jaw setting errors. The point dose QA measurement performed at isocenter may not detect the error in jaw setting. A more robust QA protocol is warranted.