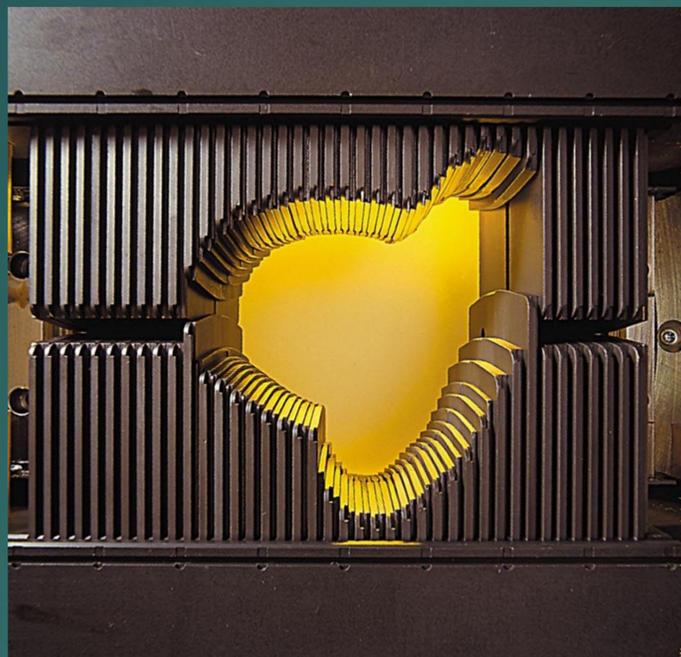


# Volumetric Intensity Modulated Arc Therapy (VMAT) Compared with Intensity Modulated Radiation Therapy (IMRT)

## IMRT

IMRT is a relatively new treatment method for radiation therapy. IMRT ensures that the beam of radiation tightly conforms to the shape of the tumor that is requiring treatment. IMRT uses a multileaf collimator to conform to the tumor (See Figure 1). The big difference between IMRT and older radiation treatments is its ability to administer treatment in a three-dimensional fashion rather than the older two-dimensional. Administering treatment within a two-dimensional range only allowed the treatment to be given within a couple different arcs. With IMRT you are able to give the treatment through many more arcs and the treatment is administered more quickly. This helps to lessen the dose to surrounding tissues and accelerates how quickly the tumor receives the prescribed dose.



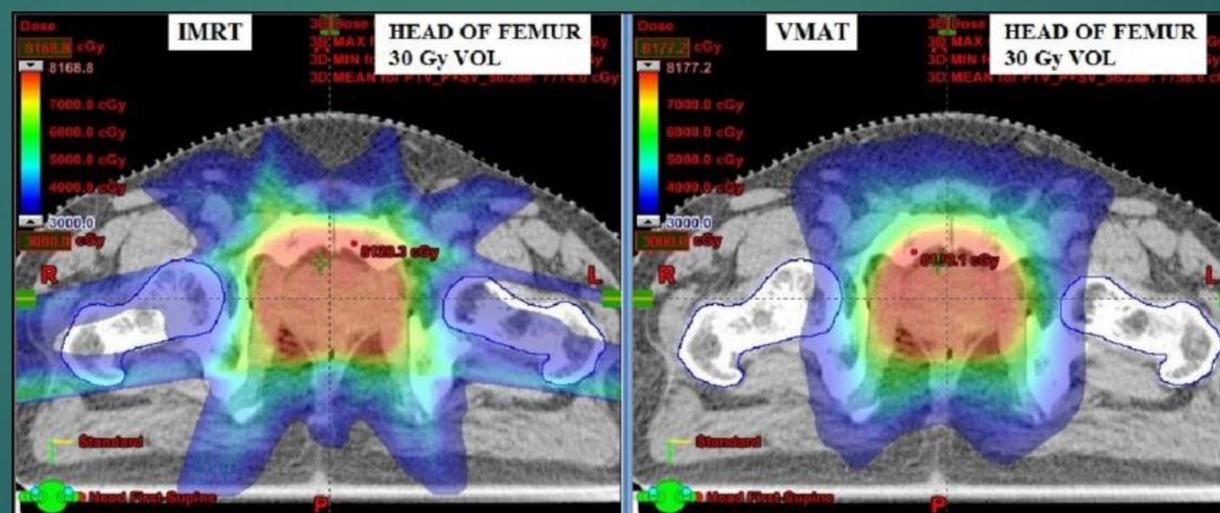
**Figure 1:** Multileaf Collimator. Leaves are able to move independently to increase conformity to treatment area.<sup>2</sup>

## VMAT

VMAT is very similar to IMRT but is more efficient in certain aspects of radiation therapy. VMAT uses the multileaf collimators to deliver the radiation dose. However VMAT delivers the dose to the tumor in a 360-degree rotation (See Figure 2). VMAT delivers the dose continuously throughout the rotation. IMRT moves to an area and treats the area then moves to the next until the treatment is completed. VMAT treats continuously as it moves throughout the arc and is able to turn the beam on and off depending on if the beam is going to penetrate critical organs or regions of the body. This helps to accelerate treatment times immensely and is more efficient in the delivery of the dose directly to the tumor. VMAT can shorten the treatment length by as much as eight times.<sup>1</sup>



**Figure 2:** Radiation Tube. Tube is able to move within a 360 degree radius around patient. This allows for more arcs to treat the patient.<sup>3</sup>



**Figure 3:** VMAT VS IMRT. This figure shows the difference in exposure to surrounding tissues depending on if IMRT or VMAT is used for treatment planning.<sup>4</sup>

## VMAT VS. IMRT

One of the main organs of interest that has been impacted by VMAT is the prostate. Prostate cancer is challenging to treat with radiation therapy. There are many side effects due to the large intestine being located near the prostate. These side effects include: stool frequency, stool consistency, fecal incontinence, rectal pain, cramping, rectal mucous discharge, urgency of defecation and rectal bleeding.<sup>5</sup> Being able to treat in a 360 degree plane has helped immensely with not irradiating the rectum as much as an IMRT plan (See Figure 3). VMAT also helps to improve the overall treatment time of the prostate cancer.

However, in some cases IMRT is the equivalent of VMAT. When treating early stage non-small cell lung cancer IMRT was more effective in delivering the dose while VMAT was lessened the total treatment time.

## Conclusion

In conclusion, VMAT and IMRT are very similar in a holistic approach. They are both state of the art therapeutic plans. They are both widely used in radiation therapy. However, in many of the cases VMAT and IMRT both delivered the correct dose. Furthermore, VMAT was more effective in time and in some cases had better conformity pertaining to delivering the dose.

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