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Would Mad Max make a good 'Blood Bag'?

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Abstract

Mad Max: Fury Road is a popular movie released in 2015. An iconic scene is where Max is transfusing blood to Nux and the aim of this paper is to find out if Max could have sustained this level of transfusion even though his heart rate was elevated and by using the timings of the movie, the suitability of Max could be found out. It was calculated that Max would not have been able to sustain transfusing blood to Nux as after 19 minutes and 50 seconds, over 60% of his blood was transfused, with the death of Max most likely occurring before this point.

Introduction

In Mad Max: Fury Road [1], a popular movie released in 2015, there are a number of scenes in which Max is giving a direct blood transfusion to another character in the film. As Max is referred to as a 'blood bag', it is presumed that Max is giving the blood, and Nux, the other character involved, is receiving the blood.

In this paper, we aim to quantify the volume of blood that is transfused from Max to Nux, and to also see if Max would be able to function and indeed, complete the action packed stunts as shown in the movie.

Assumptions

The timings of the film must first be addressed, for the purposes of this paper the 'movie time' is linear which means that it is assumed that Max is giving blood for all the time that it is shown in the movie. The first time Max is seen to give blood is at 11:22 in the film, the time that it ends is 31:12, meaning that Max has been giving blood for 19 minutes and 50 seconds [1].

It is assumed that the placement of the cannula in Max is within the right subclavian artery, directly in the centre of the artery so as not to disturb the laminar flow of blood in the artery. The right subclavian is picked because it is the closest useful artery that is seen in Figure 1.

The blood flow of the right subclavian artery is assumed to be $679.3 \pm 195.1 \text{ ml min}^{-1}$ [2], this is at a state of hyperaemia which occurs when heart rate and blood pressure are elevated in times of stress, which can be assumed to occur with Max as he is strapped to the front of a car driving extremely fast for much of the time Max is giving blood to Nux.



Figure 1) A scene from Mad Max: Fury Road in which the placement of the cannula can be clearly seen [1]

The size of the cannula placed in the subclavian artery is assumed to be a 16-gauge cannula with a maximum flow rate of 167 ml min^{-1} [3].

Max is assumed to weigh 76 kilograms [4] and estimates for how much blood is present in a person who weighs this much is 5.32 litres as it is assumed that the total blood volume is 7% of the body weight of an adult [5].

Calculations

By using the specific film timings and the maximum flow rate of the cannula used, it can easily be found

how much blood Max transfuses to Nux, this is done by the simple calculation of:

$$\text{Volume of blood} = \text{Maximum cannula flow rate} \times \text{time}$$

It is found that after 19 minutes and 50 seconds of Max transfusing blood, 3.31 litres of blood is transferred to Nux. This means that a large proportion of Max's blood is transfused to Nux - over 60% - meaning that Max would most likely not be able to function, in fact, the loss of this much blood would most likely cause Max to fall unconscious and ultimately die due to the volume of blood lost. The body would not be able to compensate that quickly for this loss of blood. If a person loses over 40% of their blood, then usually this is a fatal loss of blood [6].

For Max to be able to have a chance of surviving by losing less than 40% of his blood, then the time

taken for the transfusion must be less than 12 minutes and 30 seconds.

Conclusion

To conclude, the aim of this paper was to study the science behind the film Mad Max: Fury Road, this was done by finding out if Mad Max would have made a suitable blood bag for Nux. With Max losing over 60% of his blood in the time that he was attached to Nux means that Max would not have been able to survive past this point, this means that the ensuing action sequences and fight scenes of Mad Max would not have been able to happen. Mad Max therefore, would not make a suitable blood bag for Nux as after 12 minutes and 30 seconds Max would have become unconscious and die shortly after.

Thankfully, Mad Max is a film and suspension of disbelief can be implemented to make sure that Max does save the day.

References

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