



ISSN Print: 2394-7500  
ISSN Online: 2394-5869  
Impact Factor: 5.2  
IJAR 2017; 3(1): 837-839  
www.allresearchjournal.com  
Received: 24-11-2016  
Accepted: 25-12-2016

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## Portable X-Ray gun for whole body scanning

**Naman Jain and Amrita Dasgupta**

### Abstract

Over the number of years, we have come across cases where the accident patients suffer from trauma, paralysis, and inflammation which might not be caused because of those accidents. But has anyone ever wondered that what could be the possible reasons behind it? If we just go on to make some wild guesses, we can see that internal bleeding, breakage of bones etc. can be the possible culprits. But there are some other possible factors, that can lead to such conditions as well. One of the major reasons behind this could be the Poor Patient Handling by the Medics/Para-medics at the time of the accidents. In the following article, we intend to figure out certain ways/possibilities, where we can improve this situation to reduce the number of trauma and paralysis cases. Before jumping directly to the device and its working, we should first know what “Poor Patient Handling” means and in which areas should we focus.

**Keywords:** X-Ray gun, body scanning, poor patient handling

### Introduction

#### Motivation

Now, let us suppose there happens to be an accident and the paramedics team needs to carry the patient to the nearest hospital. The team arrives at the location of the accident and they start their rescue operation. But the question here is, ‘Do they actually know whether the patient might have any possible fracture or a minor crack? And where exactly is the fracture?’ In the other simpler words, we assume that, after an accident a person needs to be carried off to the ambulance but we don’t know for sure if he/she is having a crack or in which part of the bone. But anyways, we try to lift the person and in case if we accidentally move the patient by the point of fracture, or wrongly handle the patient, then this can lead to further trauma, inflammation and in case we hit the wrong nerve then this can even lead to paralysis for lifetime making injury worse than before.

### Facts and Figures

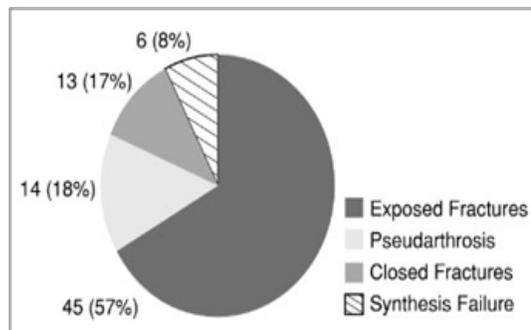
According to a study conducted with the following reference details:

“Revista Brasileira de Ortopedia

Print version ISSN 0102-3616

Rev. bras. ortop. vol.46 no.4 São Paulo 2011

<http://dx.doi.org/10.1590/S0102-36162011000400007>”



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We arrive at the conclusion that, out of the total number of accidents happening worldwide, in about 74% of the total cases people suffer from fracture - whether it's exposed or closed - but yes, the key point is that there is a fracture. When the team arrives to rescue the patient, they don't know that at which point the fracture is leading to certain problems as already discussed.

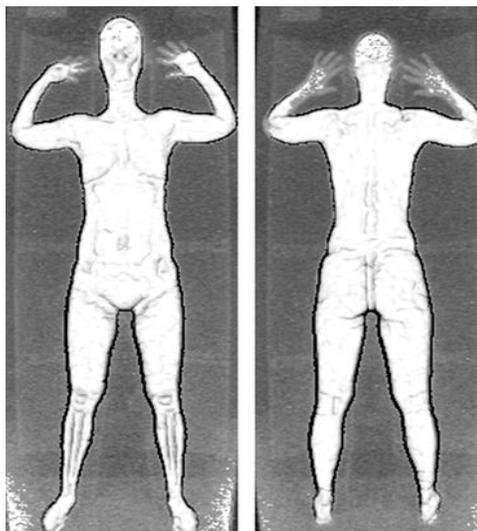
**Technology Used**  
**Backscatter Technology**

In physics, **backscatter** is the reflection of waves, particles, or signals back to the direction from which they came. It is a diffused reflection due to scattering, as opposed to specular reflection like a mirror. The major important applications of Backscatter Technology involve astronomy, photography and medical ultrasonography. Of all the applications of the Backscatter Technology, the key area of application in which we are interested is Medical Imaging. In Medical Imaging, the Compton scattering phenomena is used in Backscatter Radiation for acquiring the images used for Medical purposes.

**Backscatter Radiation**

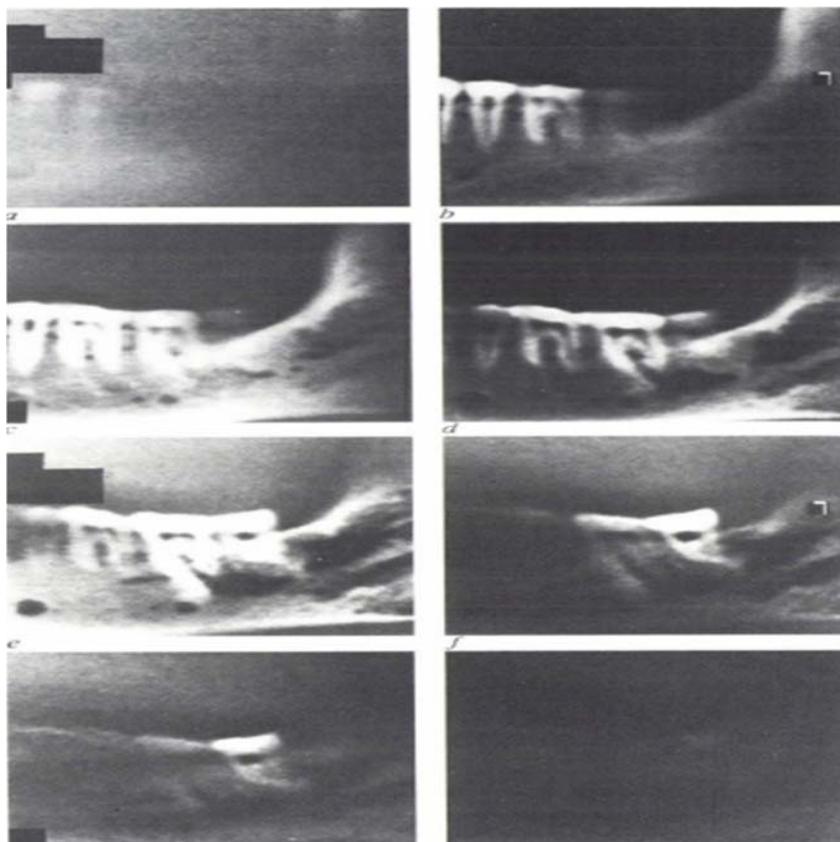
In X-Ray Imaging techniques, Backscatter Imaging is just the opposite of Transmission Imaging. In the modern era, Backscatter X-Ray technology is one of the advanced X-Ray Imaging technology. The traditional X-Ray machine employs the differentiation between hard and the soft tissues with the help of the variation in the X-Ray intensity that is being transmitted through the target. In contrast, Backscatter X-Ray does the same by detecting the radiation waves that are being reflected by the target. This leads to the potential applications - specifically where less destructive

examination is required and can even be operated if only one side of the target is available for the examination. Another advantage of this type of examination is that it can be operated irrespective of the location i.e. we don't require a proper patient bed and we can acquire the exam even in the tough circumstances for example an accident site.



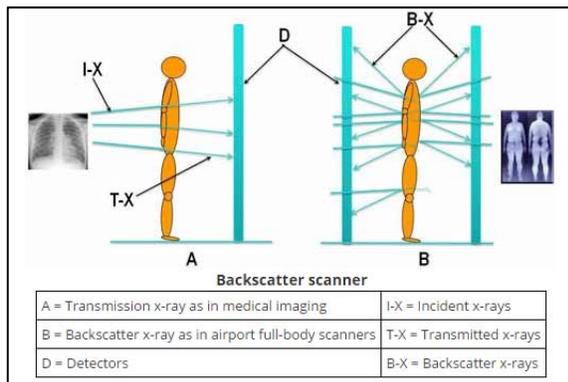
[1] Example of an image acquired by backscatter radiation

Over the years many people have been working in the field of Backscatter Radiation. They were also successful to some extent for using this phenomenon in the field of Medical Imaging. Some of the evidences that prove that Backscatter works for Medical Imaging is as below:



[2] Comparison: Transmission Vs Backscatter Radiation

The conventional systems that are in practice till date are based on transmission of radiation. In the transmission technology, the X-Rays penetrate the target; some of the X-Rays are attenuated and the remaining come out of the body from the other end. On the other end, there is an X-ray film or plate that detects these X-Rays hence forming an image. Thus, in this case we need both sides of the patient (one side for projecting the X-Rays and the other side for detecting them) but in contrast to this Backscatter Projection method requires only single side of the patient as it is self-explanatory from the image below.



[3]

### Discussions and Future Work

Using the Backscatter Technology, we wish to design a portable handy device that is easy to carry and that can be used to form a quick scan of the patient without touching him/ her. This can be best used in the case of emergency when the patient has met with an accident and the paramedics wish to transfer the patient on to the ambulance. The handheld device can be used to perform a scan and get a rough overview of the patient's situation, as whether they sustained any internal injury or fracture, so that the paramedics are able to handle the patient accordingly.

### References

1. Image from Wikipedia:  
[https://en.wikipedia.org/wiki/Backscatter\\_X-ray](https://en.wikipedia.org/wiki/Backscatter_X-ray).
2. X-Ray imaging with Compton-scatter radiation by G. Harding, H. Strecker and R. Tischler, Philips Tech Rev. 1983/1984; 41(2):56.
3. Transmission X Ray versus Backscatter X Ray.