

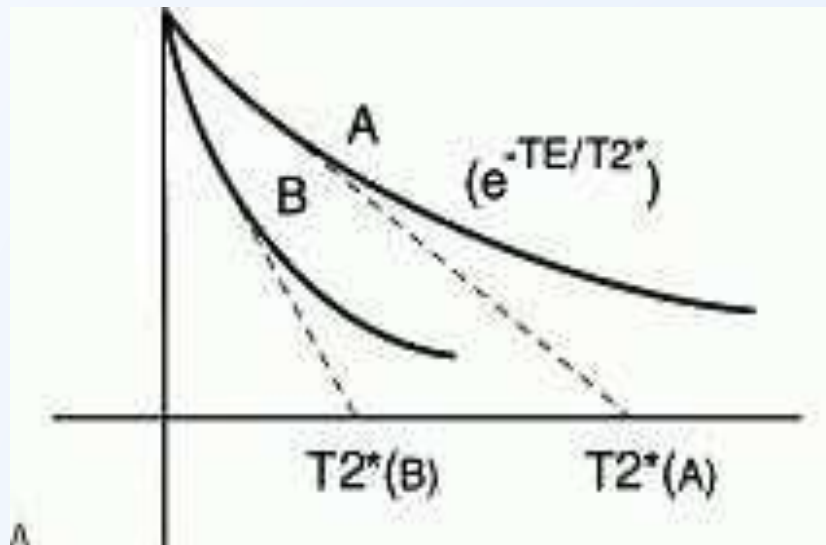
## Lesson 7 (A): T2 contrast

# Aims

- Learning the following topics about T2 and T2\* contrast:
- Effect of TE on T2 or T2\* contrast
- Effect of TE on SNR
- Effect of TE on the signals of the tissues

# T2\* or T2 Tissue Contrast

- Which tissue has a longer T2\*?

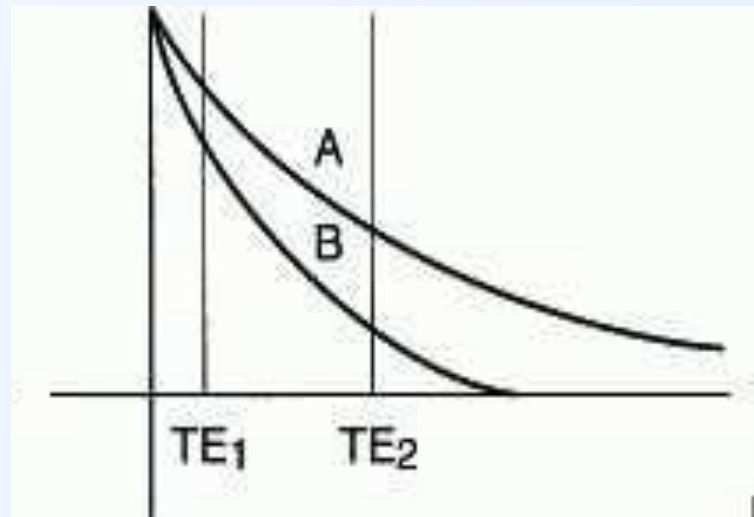


# Effect of TE on T2 or T2\* contrast

- There are 3 situations:
- Long TE and T2 or T2\* effect
- Short TE and T2 or T2\* effect
- Very short TE and T2 or T2\* effect

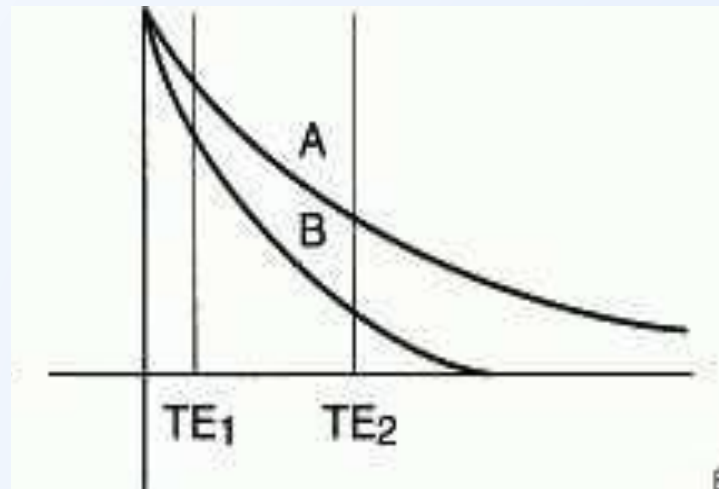
# Effect of TE on T2 or T2\* contrast

- Short TE = TE<sub>1</sub>
- Long TE = TE<sub>2</sub>
- Which TE provides better tissue contrast between A and B?



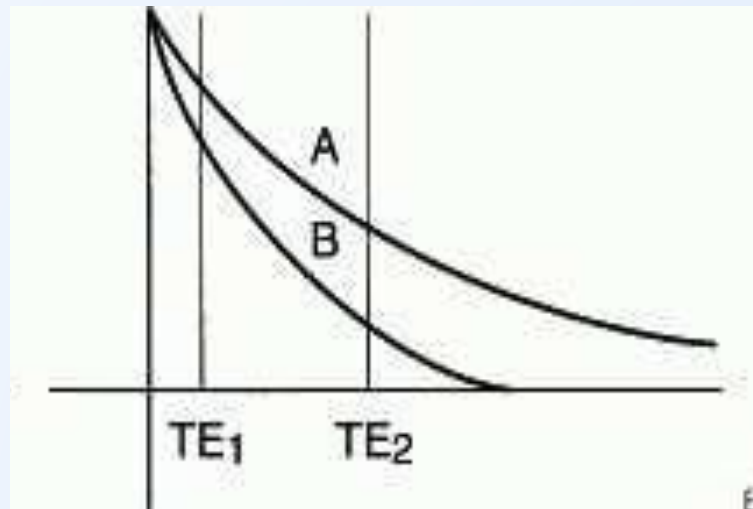
# Long TE and T2 or T2\* effect

- When we have a long TE →
- We enhance T2 or T2\* contrast between tissues.



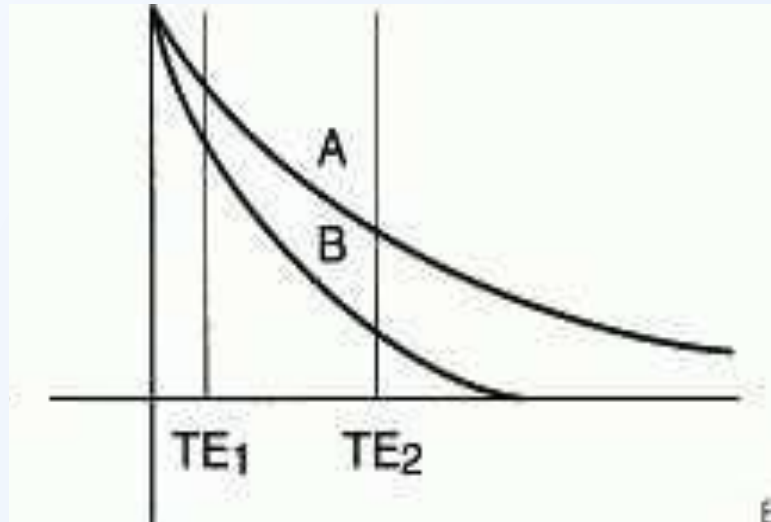
# Long TE and T2 or T2\* effect

- Important point:
- Even though the signal to noise ratio is low (because there is greater signal decay for a longer TE), the tissue contrast is high.



# Short TE and T2 or T2\* effect

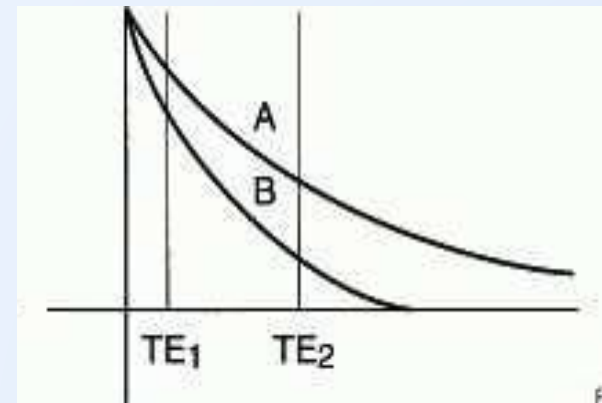
- We have a tissue contrast less than long TE.





# Very short TE and T2 or T2\* effect

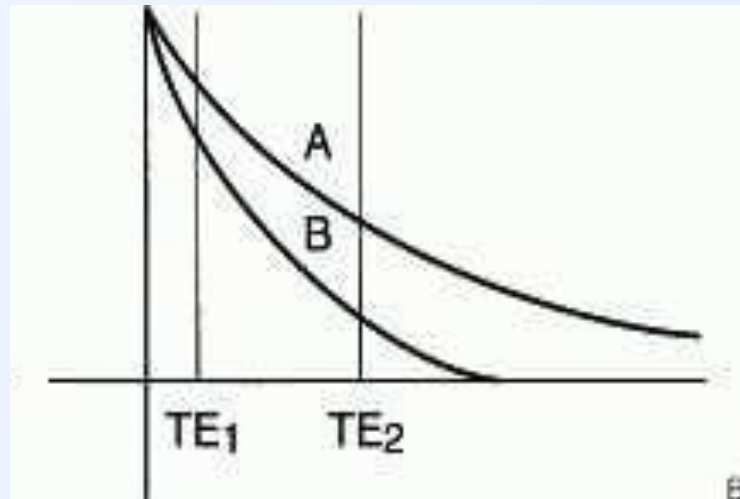
- $SI = N(H) (e^{-TE/T2^*}) (1 - e^{-TR/T1})$
- If TE is very short ( $TE \rightarrow 0$ )  $\Rightarrow$
- $e^{-TE/T2^*} \rightarrow e^0 = 1 \rightarrow$
- $SI = N(H)(1)(1 - e^{-TR/T1}) = N(H) (1 - e^{-TR/T1})$ .
- This means that with a very short TE, we eliminate (or, in reality, reduce) the T2\* effect.



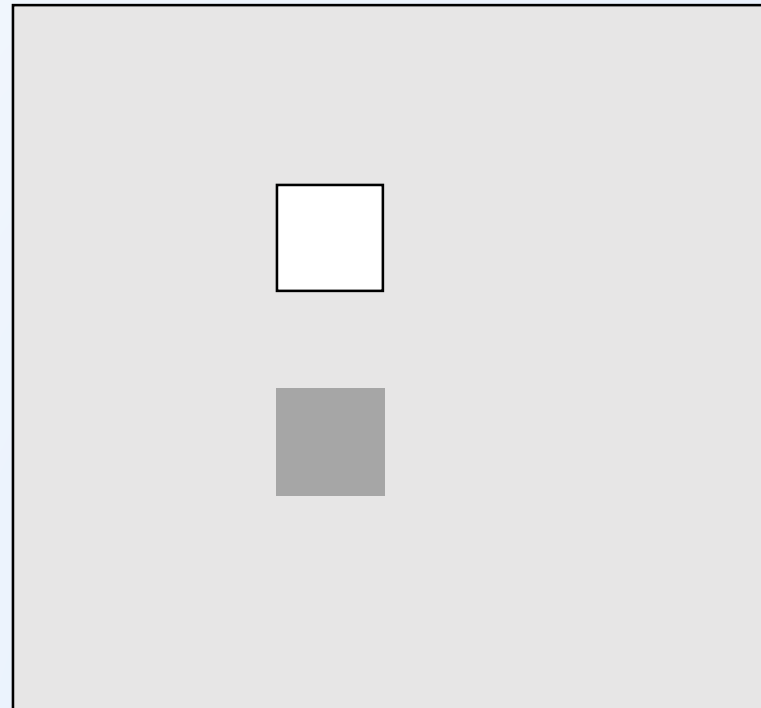
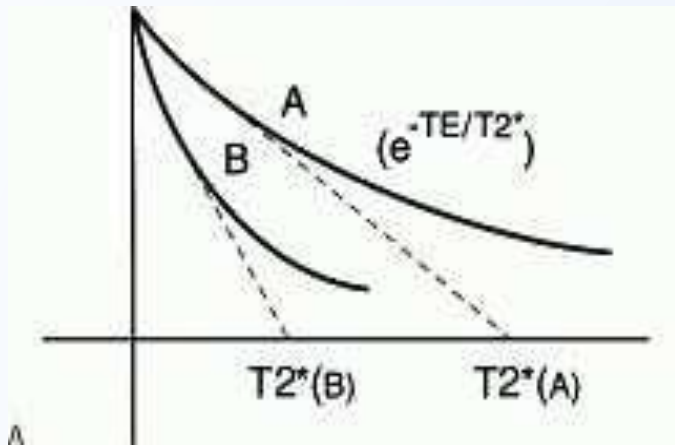
# Effect of TE on SNR

- Important point:
- Short TE selections always yield ..... SNR than long TE selections.

higher



# T2\* or T2 relaxation

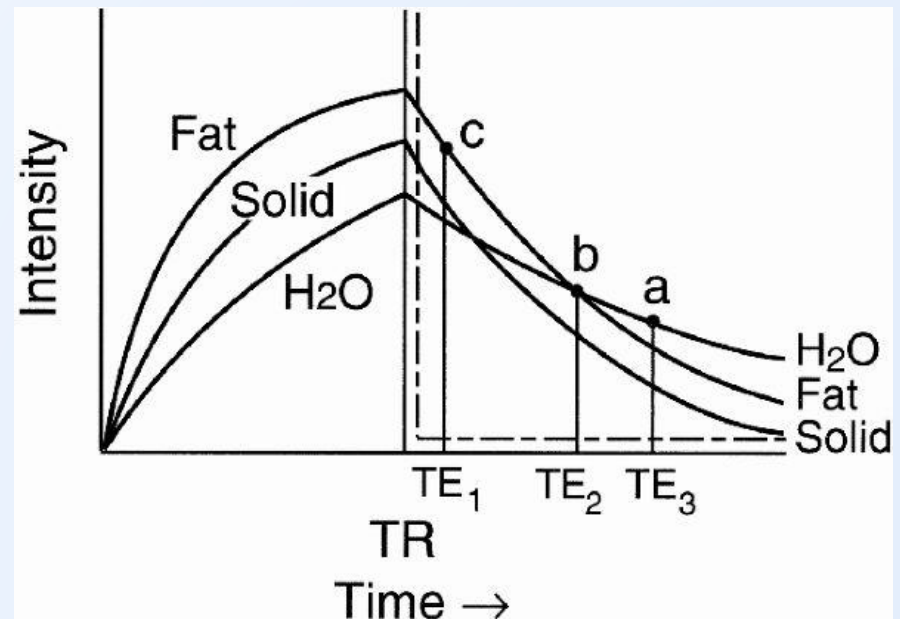


# Important points

- Short TE: ..... T2 or T2\* effect
- reduces
- Long TE: enhances T2 or T2\* effect

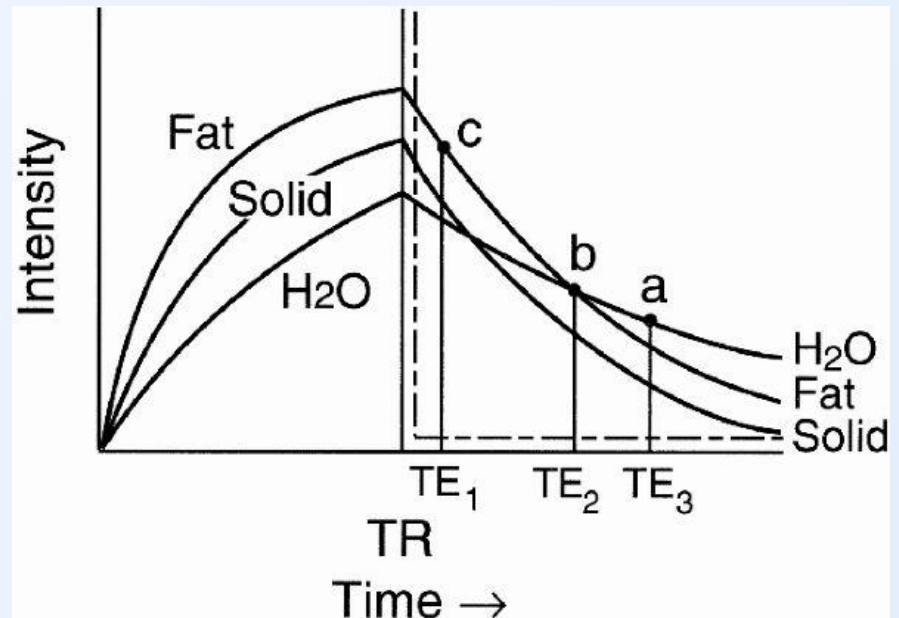
# Signals of the tissues on the T2 decay curve

- At long enough TE (TE3):
- H2O has the highest signal intensity (point a).
- Solid tissue has the lowest signal intensity.
- Fat has an intermediate signal intensity.



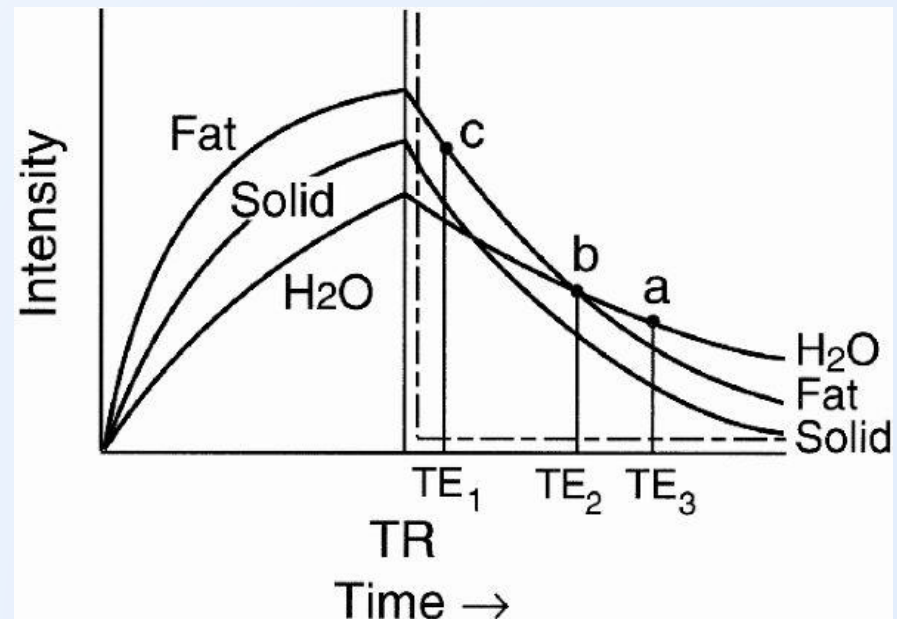
# Signals of the tissues on the T2 decay curve

- If we take a shorter TE (TE2):
- At the point b, fat and H2O have the same signal intensity.
- This is a crossover effect (point b).



# Signals of the tissues on the T2 decay curve

- If the TE is really short (TE<sub>1</sub>) →
- Fat has the highest intensity (point c).
- Solid tissue has intermediate intensity.
- H<sub>2</sub>O has the lowest intensity.



# Summary

- Effect of TE on:
- T2 or T2\* contrast
- SNR
- Signals of the tissues



# References

- Hashemi, RH and Brandy, WG. MRI the Basics, Second Edition