

Acute Liver Failure

The Mayo Experience

Focus on Preoperative Issues

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Disclosure – non-FDA drug use





Acute Liver Failure

- 2500 case pa in US
- 8% of OLT (480 in 2005)

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 - 17 cases listed for OLT since 2001
 - 15 transplanted
 - Unknown proportion of ALF cases

Preoperative Issues

- General approach to care
- ICP monitoring
- Coagulopathy/rFVIIa
- Hemodynamic support
- Renal replacement

General Approach to Care

Complex, Multidisciplinary

- Multiple services potentially involved
 - Transplant
 - Critical care
 - Infectious disease
 - Neurology
 - Neurosurgery
 - Social services
 - Psychiatry
 - Blood bank

Complex, Multidisciplinary



General Approach

- Protocolized management
- Document available
 - On line, on ICU
- Step-by-step management of major issues in ALF
- Previously agreed procedures
 - Eg coagulation parameters prior to ICP insertion
 - Consulting services involved
 - Transplant evaluation

ICP Monitor Insertion

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- Start planning for ICP monitor insertion



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ICP Monitor Insertion

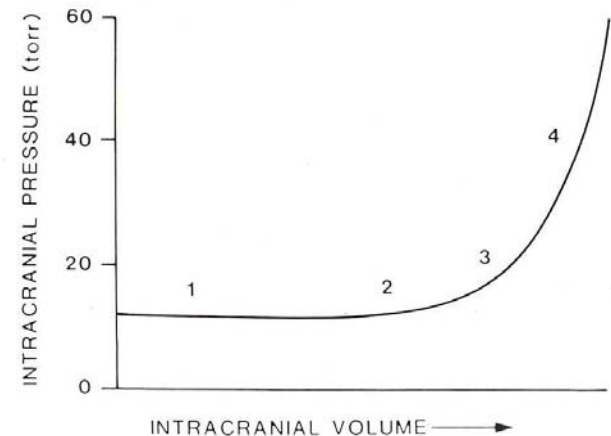
- All grade 3 or 4 encephalopathy patients intubated
- Start planning for ICP monitor insertion

- 17 patients 12 intubated
- 8 ICP monitors placed

ICP monitoring

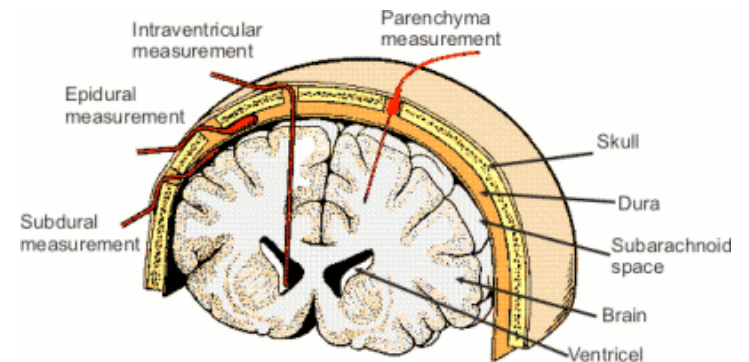
Why

- Elevated ICP common in ALF
- Without monitoring ICP assessment difficult
- Decision to treat based on data
- Effectiveness of treatment assessed



ICP Monitor Process

- Neurosurgery Service contacted
- Coagulation correction
 - INR 1.4
 - Platelets > 50
- Bedside insertion in ICU
- Intraparenchymal placement



ICP monitoring complications

- Hemorrhage
- Blei 1993 Overall 8.5%
 - Epidural 3%
 - Subdural 18%
 - Parenchymal 13%
- Vaquero 2005
 - All sites 10% (5% incidental)

Lancet 1993;341:157

Liver Transpl. 2005;11:1581

Parenchymal ICP monitoring Advantages

- Greater reliability of measurement

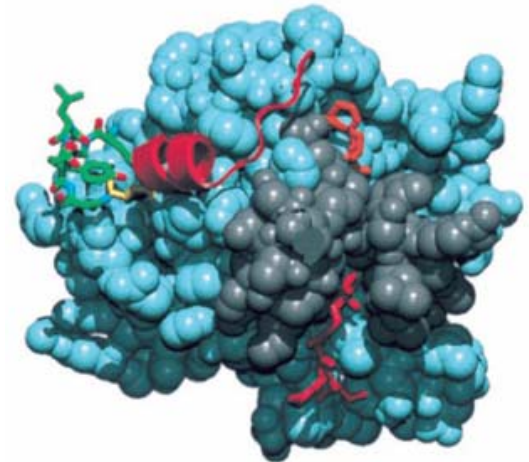
Coagulation Management

Coagulation

- No routine correction of coagulation
 - Bleeding
 - Procedures planned
- ICP monitor insertion
 - Factor VIIa (+ FFP if necessary)
 - Platelets

rFVIIa

- Improved ability to satisfactorily correct coagulation parameters
- Less volume
- If ineffective alone lesser volumes of FFP required
- 40mcg/kg



Shami *LivTrans* 2003; 9:138

Hemodynamic Support

Cardiovascular Support

- Hypotension common in ALF

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 - Concern for organ function
- Possible raised ICP
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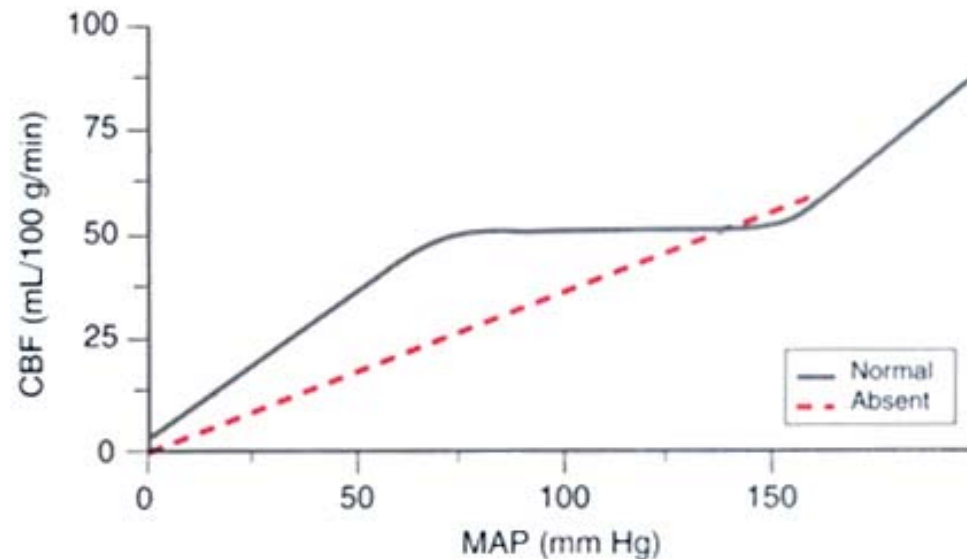
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Cardiovascular Support

- Hypotension common in ALF
- Concern for organ function
- Possible raised ICP
- Concern for cerebral perfusion
- 17 patients 12 intubated
- 10 required pressors

Cerebral Perfusion in ALF

- Loss of autoregulation
- “pressure passive” cerebral blood flow



Cerebral Perfusion in ALF

- Goals
 - Balance adequate cerebral perfusion with possible increase ICP
- Control ICP
- Target CPP 60mmHg

Which Pressors?

- Norepinephrine

Which Pressors?

- Norepinephrine
 - Increase BP, CPP
 - Little ICP effect

Larsen *J. Hepatol* 1995;23:212

Which Pressors?

- Vasopressin

Which Pressor?

- Vasopressin
 - Little direct information
 - Terlipressin (low dose)
 - No BP effect
 - Increased ICP

Which Pressor?

- Vasopressin
 - Terlipressin added to norepinephrine
 - Compared to more norepinephrine
 - NE and terlipressin increased CPP
 - No increase ICP with terlipressin
 - Modest ICP increase with more NE

Eesfsen *J. Hepatol* 2007;47:381

Which Pressor?

- Phenylephrine

Which Pressor Study Caveats

- Limited patient numbers
- Patients were stable
 - Normal ICP
 - Adequate CPP

Which Pressor

- Norepinephrine
- Add vasopressin

Renal Replacement

Renal Failure

- Common with ALF
- Renal replacement frequently needed



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- **17 patients**

Renal Failure

- Common with ALF
- Renal replacement frequently needed
- **17 patients**
- **9 dialyzed 8 CVVHD**

Conclusion

- Limited evidence to guide ALF management
- Protocols streamline the process of care