

Case Study 5

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Male driver, 29 years of age, rollover motor vehicle collision, ejected at time of impact, severe facial injuries, multiple fractures, closed head injury. Intubated in hospital due to a deteriorating GCS. Various surgeries need to repair damage to limbs and face.

5.1 Epidural Hematomas

Q1. *What is the etiology of epidural hematomas?*

Q2. *How do epidural hematomas typically present?*

Q3. *What is the general prognosis of epidural hematomas?*

5.2 Pulmonary Embolus Post ABI

Q4. *How should a suspected pulmonary embolus and diagnosed DVT be treated in light of the patient's epidural hematoma?*

5.3 Diplopia Post ABI

Q5. *What are the possible causes of diplopia?*

Q6. *List the treatments that might be used for patients experiencing diplopia post ABI.*

5.4 Community Based Rehabilitation Programs for ABI

Q7. *What is the impact of community based rehabilitation programs for patients with acquired brain injury?*

5.5 Impact of TBI on Social Integration

Q8. *Describe how an ABI impacts on social integration.*

5.6 Return to Driving

Q9. *Why do individuals who sustain a brain injury have trouble returning to driving?*

Q10. *What results in the higher incidence of accidents seen in ABI survivors who return to driving?*

Q11. *What factors are likely to influence the likelihood of driving fitness following an ABI?*

Q12. *What is the process for assessment of driving in an ABI patient for whom there are concerns about driving?*

5.7 Return to Work Post ABI

5.7.1 Impact of ABI on Work

Q13. What is the impact of an ABI on employment and productivity?

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Q15. After an ABI do patients eventually return to similar vocational activities?

5.7.4 Vocational Rehabilitation Post ABI

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Q17. How effective is vocational rehabilitation post ABI?

Q18. How important is the timing of vocational rehabilitation post ABI?

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29 year old male was involved in a single vehicle rollover collision. He was not wearing a seatbelt and was ejected from the vehicle. He sustained severe facial fractures, a closed head injury and multiple orthopedic fractures. He was airlifted to hospital and on arrival had a GCS of 13. He was subsequently intubated because of a deteriorating GCS. CT scan showed a larger right frontal subdural/epidural hemorrhage with midline shift and uncal herniation. He required multiple surgeries for his orthopedic and facial fractures. He was taken to the OR for a right sided decompressive craniotomy. Intraoperatively they reported a large epidural hematoma; bone flap was left off and replaced one month later.

The patient was admitted to rehabilitation 6 weeks after his injury. At that time he was alert, with short-term memory difficulties, subtle difficulties with word finding and higher level tasks. CT scan of his head demonstrated bilateral inferior frontal lobe and left temporal lobe contusions with hypodensity of the brain compatible with encephalomalacic change in addition to an extradural fluid collection in the right frontal region which indented the underlying brain.

5.1 Epidural Hematoma

Q1. What is the etiology of epidural hematomas?

Answer

1. Result of head trauma, usually associated with skull fracture, with laceration of dural veins and arteries.
2. Usually associated with a tear of the middle meningeal artery.

Discussion

An epidural hematoma is defined as an accumulation of blood in the potential space between dura and bone. An intracranial epidural hematoma has been found to occur in approximately 2% of patients who sustain a brain injury and 5-15% of those who sustain a fatal head injury. Once diagnosed, surgical interventions are needed.

Q2. How do epidural hematomas typically present?

Answer

1. Half of the patients present with the classical picture of a lucid period followed by clinical deterioration.

Q3. What is the general prognosis of epidural hematomas?

Answer

1. The underlying brain injury is often not severe if treated promptly.
2. If due to an arterial laceration an epidural hematoma can evolve rapidly and lead to deterioration and even death.
3. If detected early, mortality is less than 10%.

5.2 Pulmonary Embolus Post ABI

Case Study (continued)

Shortly after the surgery he developed problems with respiratory distress and was diagnosed with a right DVT as well as a suspected pulmonary embolus.

Q4. How should a suspected pulmonary embolus and diagnosed DVT be treated in light of the patient's epidural hematoma?

Answer

1. Should not use anticoagulation in the acute phase.
2. Inferior vena cava filter would be indicated in this case.

Discussion

One method of mechanical DVT prevention is the vena cava filter (Watanabe and Sant, 2001). These filters, of which there are several varieties to choose from, are inserted into the inferior vena cava to prevent the passage of emboli into the lungs. Some reports have demonstrated success rates as high as 96% in the prevention of pulmonary emboli (Greenfield and Michna, 1988). However, the use of vena cava filters also carry some associated risks: They can become blocked or dislodged, which can both increase the risk of an embolism. Some have also reported increased risks for repeated DVT in patients with vena cava filters compared with patients without such devices (Decousus et al. 1998).

Case Study (continued)

An IVC filter was inserted for two weeks and then removed. Patient was then initiated on Coumadin.

5.3 Diplopia Post ABI

Case Study (continued)

The patient suffered an orbital fracture. While on rehabilitation he tells staff he is experiencing "double vision" which is diagnosed as diplopia

Q5. What are the possible causes of diplopia?

Answer

Post ABI the most common causes of diplopia are:

1. *Physical trauma to the muscles of the eye*
2. *Damage to the peripheral nerves controlling the muscles of the eye*
3. *Cerebral contusion/intracranial hemorrhaging*

Q6. List the treatments that might be used for patients experiencing diplopia post ABI.

Answer

For patients experiencing diplopia the following treatments may be recommended:

1. *Vision exercises*
2. *Fixation Exercises*
3. *Pencil push ups*
4. *Visual gymnastics*
5. *Prisms*

Exercises generally last 10 minutes and are usually conducted every other day.

5.4 Community Based Rehabilitation Programs for ABI

Case Study (continued)

The patient was eventually discharged home, fully ambulatory but still with short-term memory difficulties, some trouble with higher level ADL tasks, irritability and complaining of some anxiety about leaving the hospital. A community based rehabilitation program is recommended but the insurer questions the benefit of a community based rehabilitation program for this patient.

Q7. What is the impact of community based rehabilitation programs for patients with acquired brain injury?

Answer

1. *Level 2 evidence that rehabilitation, whether hospital-based (outpatient) or community-based, improves the level of independence for persons with an ABI. These effects were maintained one to three years later.*
2. *There is Level 4 evidence for the positive effects of community-based rehabilitation programs that use a peer or supported relationship model of intervention.*

3. *The data supporting community based rehabilitation for ABI patients is by no means definitive and there is some question as to its benefit for a physical mobility and cognitive independence.*

Discussion

Rehabilitation care provided in the community is often proposed as an attractive and cost effective alternative to residential or hospital-based rehabilitation programs. Overall, the evidence for community-based rehabilitation is not better than that for institutional care; however, there is some benefit in focusing on psychosocial and community reintegration issues although the data supporting community based rehabilitation for ABI patients is by no means definitive and there is some question as to its benefit in physical mobility and cognitive independence issues.

5.5 Impact of TBI on Social Integration.

Case Study (continued)

At 6 month follow-up the patient and his spouse note that he has not yet returned to work. Although many friends dropped by to visit initially, they note that friends do not drop by as much. They do not go out as much, which they attribute in part to the patient's fatigue near the end of the day. His wife notes that he is no longer able to maintain a conversation as he did before when he was "more interesting to talk to". The patient complains he is not working and has nothing interesting to talk about. Several of their friends have noted that the patient is not himself and although they remain friends they call less often.

Q8. Describe how an ABI impacts on social integration

Answer

1. *Fewer friends and social contacts*
2. *Greater degree of dissatisfaction with social networks*
3. *Negative reactions of peers*
4. *Reduced self-esteem*

Discussion

Individuals with traumatic brain injury (TBI) often face isolation and a lack of social support (Johnson and Davis, 1998). Persons having experienced a brain injury reported having fewer friends and social contacts, and a greater degree of dissatisfaction with social networks than individuals without TBI (Johnson and Davis, 1998). Young people who have sustained a brain injury often recognize that the reaction of their peers is the most limiting factor predicting successful social integration. Reduced self-esteem and a perceived decline in personal sex

appeal have been reported as common personality changes following head injury (Kreutzer and Zasler, 1989) (Kreuter et al. 1998). Individuals who identified themselves as 'impaired' or inadequate in some way did not perceive themselves as confident or attractive and did not pursue or recognize safe opportunities for pair-bonding or sexual activity. Although social integration is an area of great diversity and importance to brain injury survivors, there are few empirical studies describing the interventions intended to improve the lived experiences of these individuals.

5.6 Return to Driving

Case Study (continued)

The patient notes that if he is going to return to work he needs to be able to return to driving. Otherwise, he will be dependent on friends, family or taxis for transportation.

Q9. Why do individuals who sustain a brain injury have trouble returning to driving?

Answer

- 1. Driving requires effective function in the realms of perception, cognition, communication and coordination.*
- 2. Driving requires functional vision, rapid, reliable responses, quick decision-making and the ability to remain attentive despite distractions.*

Discussion

Driving a motor vehicle requires effective function in multiple domains, including perception, cognition, communication, and coordination. First and foremost, driving depends on functional vision and rapid reliable responses, as well as quick decision-making and the ability to remain attentive despite distractions.

Q10. What results in the higher incidence of accidents seen in ABI survivors who return to driving?

Answer

- 1. There is high incidence of accidents in ABI survivors who return to driving which may be related to patients prematurely returning to driving.*
- 2. 50% of persons with severe TBI and 75% of those with moderate TBI actually resume driving a motor vehicle following injury.*
- 3. Those individuals who return to driving against professional recommendations have a high probability of being involved in traffic accidents*

Discussion

The ability to drive is seen by many as a key determinant for an individual's social competence and independence. Persons with an ABI may have difficulty driving due to an inability to keep track of many simultaneous inputs, as found in complex traffic situations (Formisano et al. 2005). Perino and Rago (1997) estimated that only 50% of persons with severe TBI (and 75% of persons with moderate TBI) actually resume driving a motor vehicle following injury.

Q11. What factors are likely to influence the likelihood of driving fitness following an ABI?

Answer

Patients with more severe injuries are less likely to be successful returning to driving.

- 1. Pre-injury personality and behaviours such as violations before injury, pre-injury risky personality and pre-injury risky driving styles all decrease the likelihood of driving fitness post ABI.*
- 2. There is Limited evidence that participation in a multidisciplinary rehabilitation program increases the percentage of patients who return to driving following an ABI.*

Discussion

It is believed that ABI patients return to driving in an effort to feel independent, even if they are not fit to do so (Leon-Carrion et al. 2005). This contributes to the higher likelihood for ABI survivors to be involved in accidents compared with the general population (Buffington and Malec, 1997) Driving simulators have proven useful in predicting actual driving performance. Return to driving may be more likely for patients with less severe injuries (Pietrapiana et al. 2005). It has also been reported that violations before injury, pre-injury risky personality, and pre-injury risky driving styles all decrease the likelihood of driving fitness following ABI (Leon-Carrion et al. 2005).

Q12. What is the process for assessment of driving in an ABI patient for whom there are concerns about driving?

Answer

All patients with moderate to severe ABI need to be assessed by a physician with experience in brain injury and access to a multidisciplinary team.

Advise the appropriate government body about the ABI, neurological impairments and concerns about driving safety.

Ensure the patient and their caregivers are aware of the law and driving post ABI.

If the patient's fitness to drive is unclear, a comprehensive assessment of capacity to drive should be undertaken at an approved driving assessment centre.

ACCORDING TO ABIKUS RECOMMENDATIONS (BAYLEY ET AL. 2007)

Driving

For all patients with a moderate to severe ABI, including adolescents, a physician with experience of brain injury should screen patients who wish to drive, in accordance with legislation, where appropriate in liaison with the multidisciplinary team. (ABIKUS C, adapted from RCP, G156, p.49) (G90-p.31)

If members of the interdisciplinary rehabilitation team during assessment or treatment determine that the person's ability to operate a motor vehicle safely may be affected, then they should:

- 1. Advise the patient and/or their advocate that they are obliged by law (if applicable) to inform the relevant government body that the individual has suffered a neurological or other impairment and to provide the relevant information on its effects*
- 2. Provide information about the law and driving after brain injury*
- 3. Provide clear guidance for the GP, other treating health professionals and family/caregivers, as well as the patient, about any concerns about driving, and reinforce the need for disclosure and assessment in the event that return to driving is sought late post-injury*

(ABIKUS C, adapted from RCP, G157, p.49) (G91-p.31)

If the patient's fitness to drive is unclear, a comprehensive assessment of capacity to drive should be undertaken at an approved driving assessment centre (ABIKUS C, adapted from RCP, G157, p.49) (G92-p.31)

5.7 Return to Work Post ABI

Case Study (continued)

As mentioned earlier, at 6 month follow-up the patient has not yet returned to work as an engineer in a large factory. He has been employed at this job for the past 4 years. He wants to return to work but is worried about fatigue and some anxiety. His wife still complains he has short-term memory problems and does not communicate as well as pre-accident. His employer is willing to consider a return to work plan and make appropriate adjustments or work modifications but wants medical clearance that he is in fact able to successfully return to work.

5.7.1 Impact of ABI on Work

Q13. What is the impact of an ABI on employment and productivity?

Answer

- 1. Individuals with an ABI suffer significant declines in employment and productivity.*
- 2. The more severe the ABI the less likely the patient will return to work.*

Discussion

Individuals who suffer an ABI experience significant declines in their employment and productivity rates following their injury. One study looking at the expected rate of return to work found reported that 66.5% of all patients (regardless of severity) returned to work 1 year after TBI, while 72% return to work 2 years after the injury (Dikmen et al. 1994). In those who sustained severe injuries, only 37% return to work 2 years after the injury (Dikmen et al. 1994). Cifu et al. (1997) reported that persons with better injury severity indicators (e.g., admission GCS) are more likely to return to the workforce; however findings also suggest of patients who were productive before the injury, only 37% were productive 1-2 years after injury.

5.7.2 Impact of Work on Life Satisfaction Post ABI

Q14. What is the impact of return to employment on life satisfaction following ABI?

Answer

1. Successful return to work is associated with improved life satisfaction following ABI.
2. Failure to achieve gainful and challenging employment is associated with decreased life satisfaction.

Discussion

Vocational success has significant implications for life satisfaction following ABI. Decreased life satisfaction has been associated with unemployment, and with passive uninvolved lifestyles following ABI (Melamed et al. 1992). Life satisfaction following ABI seems to be directly related to employment and social integration (Corrigan et al. 2001) (Tennant et al. 1995). In some Western societies, participation in employment starting in young adulthood is promoted as a means of achieving social and financial stability. Brain injury often deprives individuals from participating in gainful and challenging employment, thus isolating brain injury survivors from the rest of society and fostering feelings of despair and worthlessness.

5.7.3 The Type of Work ABI Patients Return To

Q15. After an ABI do patients eventually return to similar vocational activities?

Answer

1. Following ABI, those patients who reintegrate into vocational activities return to lower levels of employment or schooling, and only a small number are able to return to vocational activities which are comparable to pre-morbid levels.

Discussion

Oftentimes, following brain injury, those who resume vocational activities must return to lower levels of employment or academics. Only a small number are able to return to their prior jobs or to school at levels comparable to their pre-morbid status. In a cohort study conducted by Walker et al. (2006), the greatest success in returning to work following an ABI was found for those in the professional/managerial job category.

5.7.4 Vocational Rehabilitation Post ABI

Case Study (continued)

The specialist who is managing the patient is concerned that the patient is not yet ready to return to work and recommends vocational rehabilitation.

Q16. For ABI patients seeking to return to employment, what are the elements of vocational assessment?

Answer

1. *Evaluation of individual vocational and educational needs.*
2. *Identification of barriers to successful return to work.*
3. *Direct liaison with employers to discuss the special needs of the ABI individual.*
4. *Evaluation of the workplace.*
5. *Determination of work modifications.*
6. *Ongoing follow-up.*

ACCORDING TO ABIKUS RECOMMENDATIONS (BAYLEY ET AL. 2007)

Vocational Rehabilitation

Patients seeking a return to employment, education or training should be assessed by a professional or team trained in vocational needs following brain injury. Assessment should include:

1. *Evaluation of their individual vocational and/or educational needs*
2. *Identification of difficulties which are likely to limit the prospects of a successful return and appropriate intervention to minimize them*
3. *Direct liaison with employers (including occupational health services when available), or education providers to discuss needs and the appropriate action in advance of any return*
4. *Evaluation of environmental factors, workplace, psychosocial aspects including social environment and work culture*
5. *Verbal and written advice about their return, including arrangements for review and follow-up (ABIKUS C, adapted from RCP, G159, p.50) (G93-p.32)*

Clinicians involved in brain injury rehabilitation should consider vocational needs and put patients in touch with the relevant agencies as part of their routine planning, and refer where

appropriate, to a specialist vocational rehabilitation program (ABIKUS C, adapted from RCP, G158, p.50) (G94-p.32)

In setting up placement into a long-term job, monitoring should be provided for at least six months or longer to respond to any emergent difficulties, with a follow-up thereafter to establish the long-term viability of the placement. (ABIKUS C, adapted from RCP, G164, p.51)

Q17. How effective is vocational rehabilitation post ABI?

Answer

- 1. There is Level 2 evidence that cognitive strategies increase the proportion of patients who successfully return to full time vocational activities following brain injury.*
- 2. There is Level 3 evidence (from one Case-Control study) that supported employment strategies following brain injury cause improvements in competitive job placement and retention.*

Discussion

Participation within groups that provide cognitive strategies which can be applied to the work place seems to increase the proportion of brain injury survivors who successfully return to full time employment (Parente and Stapleton, 1999). Cognitive strategies, such as the problem solving techniques, seem to improve the level of employment success once a person has obtained employment (O'Reilly et al. 2000). The model of supported employment emphasizes job development, job placement, on-site job training, and retention services to ensure the successful return to employment following brain injury. The most important aspect of this vocational intervention seems to be on-site job training provided by vocational rehabilitation experts. Increased job success may be achieved through community based vocational training programs which combine the concepts of work adjustment and supported employment (Wall et al. 1998).

Q18. How important is the timing of vocational rehabilitation post ABI?

Answer

- 1. There is Level 4 evidence that vocational rehabilitation strategies are more effective when they are implemented earlier following the injury*

Discussion

The timing of vocational interventions seems to play a key role on the successful reintegration into vocational activities. Buffington and Malec (1997) found that patients who received vocational services at ≤12 months following their injuries, had significantly faster and more independent job placements than those who received the same services >12 months after their injuries. These results suggest that vocational rehabilitation strategies should be implemented as early as possible to improve the likelihood of successful vocational reintegration.

Reference List

- Bayley M, Teasell R, Kua A, Marshall S, Cullen N, Colantonio A. *ABIKUS Evidence Based Recommendations for Rehabilitation of Moderate to Severe Acquired Brain Injury*. 1st ed. Ontario Neurotrauma Foundation, 2007.
- Buffington ALH, Malec JF. The vocational rehabilitation continuum: maximizing outcomes through bridging the gap from hospital to community-based services. *J Head Trauma Rehabil* 1997;12:1-13.
- Cifu DX, Keyser-Marcus L, Lopez E et al. Acute predictors of successful return to work 1 year after traumatic brain injury: a multicenter analysis. *Arch Phys Med Rehabil* 1997;78:125-131.
- Corrigan JD, Bogner JA, Mysiw WJ, Clinchot D, Fugate L. Life satisfaction after traumatic brain injury. *J Head Trauma Rehabil* 2001;16:543-555.
- Decousus H, Leizorovicz A, Parent F et al. A clinical trial of vena caval filters in the prevention of pulmonary embolism in patients with proximal deep-vein thrombosis. Prevention du Risque d'Embolie Pulmonaire par Interruption Cave Study Group. *N Engl J Med* 1998;338:409-415.
- Dikmen SS, Temkin NR, Machamer JE, Holubkov AL, Fraser RT, Winn HR. Employment following traumatic head injuries. *Arch Neurol* 1994;51:177-186.
- Formisano R, Bivona U, Brunelli S, Giustini M, Longo E, Taggi F. A preliminary investigation of road traffic accident rate after severe brain injury. *Brain Inj* 2005;19:159-163.
- Greenfield LJ, Michna BA. Twelve-year clinical experience with the Greenfield vena caval filter. *Surgery* 1988;104:706-712.
- Johnson K, Davis PK. A supported relationships intervention to increase the social integration of persons with traumatic brain injury. *Behaviour Modification* 1998;22:502-528.
- Kreuter M, Dahllof AG, Gudjonsson G, Sullivan M, Siosteen A. Sexual adjustment and its predictors after traumatic brain injury. *Brain Inj* 1998;12:349-368.
- Kreutzer JS, Zasler ND. Psychosexual consequences of traumatic brain injury: methodology and preliminary findings. *Brain Inj* 1989;3:177-186.
- Leon-Carrion J, Dominguez-Morales MR, Martin JM. Driving with cognitive deficits: neurorehabilitation and legal measures are needed for driving again after severe traumatic brain injury. *Brain Inj* 2005;19:213-219.

Melamed S, Groswasser Z, Stern MJ. Acceptance of disability, work involvement and subjective rehabilitation status of traumatic brain-injured (TBI) patients. *Brain Inj* 1992;6:233-243.

O'Reilly MF, Lancioni GE, O'Kane N. Using a problem-solving approach to teach social skills to workers with brain injuries in supported employment settings. *Journal of Vocational Rehabilitation* 2000;14:187-194.

Parente R, Stapleton M. Development of a cognitive strategies group for vocational training after traumatic brain injury. *NeuroRehabilitation* 1999;13:13-20.

Perino C, Rago R. Problematiche di guida sicura dopo T.C.E. *Giornale Italiano di Medicina e Riabilitazione* 1997;1:53-58.

Pietrapiana P, Tamietto M, Torrini G, Mezzanato T, Rago R, Perino C. Role of premorbid factors in predicting safe return to driving after severe TBI. *Brain Inj* 2005;19:197-211.

Tennant A, Macdermott N, Neary D. The long-term outcome of head injury: implications for service planning. *Brain Inj* 1995;9:595-605.

Walker WC, Marwitz JH, Kreutzer JS, Hart T, Novack TA. Occupational categories and return to work after traumatic brain injury: a multicenter study. *Arch Phys Med Rehabil* 2006;87:1576-1582.

Wall JR, Rosenthal M, Niemczura JG. Community-based training after acquired brain injury: preliminary findings. *Brain Inj* 1998;12:215-224.

Watanabe TK, Sant MO. Common medical complications of traumatic brain injury. *Physical Medicine and Rehabilitation: state of the arts reviews* 2001;15:283-299.