| Author         | Patient number | Patient group / Surgery indication                               | Study description | Methods                                                                 | Results                              |
|---------------|----------------|-----------------------------------------------------------------|-------------------|-------------------------------------------------------------------------|--------------------------------------|
| Baron 1987    | 912            | Vascular patients: claudication or limb threatening ischemia     | Retrospective     | 1977 to 1982 Patients received continuous epidural catheter. During a portion of the surgical procedure all the patients were transiently totally heparinized. | Epidural haematoma: 0 Permanent neurological injury: 0 |
| Odoom 1983    | 950            | Vascular surgery: Reconstructive vascular surgery                | Retrospective     | 1976 to 1980 All patients receiving pre-operative oral anticoagulation therapy. Upon arrival in the induction room, thrombotest, partial thromboplastin time and kaolin cephalin clotting time were determined. After induction of anaesthesia an epidural catheter was introduced with a test-dose. Before arterial cross clamping heparin was injected intraarterially, then 250-300 ug heparin/min for 0.5 to 3 hours. Duration of the catheter 48 hours. Three months later full neurological examination. | Epidural haematoma: 0 Permanent neurological injury: 0 |
| Rao 1981      | 3164           | Vascular surgery: lower extremity peripheral vascular surgery    | Prospective       | 1973-1978 Continuous epidural anaesthesia. Upon arrival in the operating room, introduction of an epidural catheter. If blood was aspirated the patient was rescheduled for surgery under general anaesthesia the following day. Intraoperatively, 50 to 60 minutes after performing the regional block, incremental doses of 500 U of heparin every 3 minutes. Repetition of the heparin dose after 6 hours. 24 hours after insertion, catheter was removed one hour before the maintenance dose of heparin. | Epidural haematoma: 0 Permanent neurological injury: 0 Transient neurological injury: 4 Four patients experienced paraesthesias in the thigh and leg 3 to 4 days following removal of the catheter. Resolved completely within 3 weeks. |
| Horlocker 2003| 4298           | Mixed: cardiac surgery and thoracic surgery: 4108 (94.4%) procedures primarily thoracic, 245 (5.6%) primarily cardiac. | Prospective data collection, but retrospective data analysis | 1991 to 1997 Catheters placed immediately after induction and tracheal intubation or on completion of the surgical procedure, before emergence. The mean duration of epidural analgesia was 2.4±0.8 days (range, 0–10.7 days). There were no neurologic complications, including spinal haematoma, epidural abscess or catheter site infections, radicular symptoms, or persistent paraesthesias (95% confidence interval, 0-0.08%). Patients undergoing thoracotomy (4054, or 94.3%) typically received heparin 5000 U subcutaneously 2 hours before surgery and then every 12 hours while immobilized. | Epidural haematoma: 0 Permanent neurological injury: 0 Six patients developed new neurological symptoms or postoperative worsening of a previous neurological condition. In all six patients, formal neurologic consultation concluded that epidural catheterization was not the primary cause of the neurologic deficits |
| Study       | Year | Study Type | Cardiac Surgery | Inclusion Criteria | Epidual catheter insertion | Normal Coagulation Screening | Normal Cardiac Surgery | Heparin Infusions | Patient Monitoring | Epidural Haematoma | Permanent Neurological Injury | Transient Neurological Injury |
|-------------|------|------------|-----------------|-------------------|-----------------------------|-------------------------------|------------------------|-------------------|-------------------|-----------------|--------------------------|---------------------------|
| Chakravarthy | 2005 | Prospective | Cardiac surgery | 1991 to 2003 | Puncture of the epidural the day before. Heparin infusions discontinued 6 hours before performing epidural catheterization. | | | | | | | |
| Pastor      | 2003 | Prospective | Cardiac surgery: coronary artery bypass surgery with cardiopulmonary bypass | 1995 to 2002 | Inclusion criteria: elective surgery, coagulation tests normal, adequate preoperative suspension (7 days) of antiplatelet drugs (aspirin or clopidogrel). Puncture done with patient awake, 60 minutes before using heparin. Median approach only. Patients with oral anticoagulants: catheter systematically removed before the anticoagulation was effective. Normally 4 days of treatment with the epidural. | | | | | | | |
| Canto       | 2002 | Prospective | Cardiac surgery: heart valve surgery | 1995 to 2000 | Patients who had replacement or repair of cardiac valves under combined general and epidural anaesthesia. Inclusion criteria: antiplatelet drugs had to be suspended for at least 7 days preoperatively, normal coagulation tests, elective surgery. Insertion of the epidural catheter immediately before induction for general anaesthesia. Heparin intraoperatively to maintain an activated clotting time >450 second as well as mild hypothermia (30°C). No blood through the needle during puncture. | | | | | | | |
| Oxelbark    | 2001 | Unclear, probably retrospective | Cardiac surgery: coronary artery bypass surgery, redo surgery, aortic surgery | 1999 to 2000 | 250 unselected patients. 12 to 24 hours preoperatively, a thoracic epidural catheter was inserted in the thoracic 2/3 or 3/4 intervertebral space and kept in place for 4 to 5 days. Oral anticoagulation stopped 10 days preoperatively. Normothermic bypassing. All patients extubated 10 minutes after skin closure. | | | | | | |
| Scott       | 2001 | Randomised controlled trial | Cardiac surgery: coronary artery bypass | Epidual catheter insertion immediately before surgery. Normal coagulation screening. In case of bloody tap, surgery was postponed for 24 hours. Heparin given to achieve activated clotting time >450 sec. Cardioplegia with 28°C. Orally Ibuprofen every 8 hours. Epidural catheter for 96 hours. | | | | | | | |
| Warters     | 2000 | Retrospective | Coronary artery bypass | No time duration of study indicated | Epidural catheters were inserted no less than 1 hour before anticoagulation. In case of bloody tap, surgery was delayed for 24 hours. Catheters removed only if the international normalized ratio was greater than 1.5. | | | | | | |
| Study               | Year | Sample Size | Study Design | Procedure Description                                                                 | Complications |
|--------------------|------|-------------|--------------|----------------------------------------------------------------------------------------|---------------|
| Sanchez 1998       | 558  |             | Prospective  | Cardiac surgery: coronary artery bypass surgery with cardiopulmonary bypass. Prospective 1993 to 1995. A Tuohy 18G epidural catheter was inserted the day before surgery; not more than 3 unsuccessful puncture attempts. The presence of a small amount of blood during needle or catheter placement was not recorded. No patient was on oral anticoagulation, 403 patients were on antiplatelet therapy which was stopped one week preoperatively. Modest bypass hypothermia of 32ºC. Catheter was left for up to 5 days. | Epidural haematoma: 0
|                    |      |             |              | Permanent neurological injury: 0                                                        |               |
| Turfrey 1997        | 100  |             | Retrospective| Cardiac surgery: routine coronary artery bypass graft surgery. Retrospective 9 month period In total there were 218 patients: 118 without epidural, 100 patients with epidural. Epidural catheter was inserted immediately before induction of anaesthesia. Patients with abnormal coagulation did not receive an epidural. Aspirin-patients were not excluded. | Epidural haematoma: 0
|                    |      |             |              | Permanent neurological injury: 0                                                        |               |