Phrenic Nerve Paralysis after Pediatric Cardiac Surgery: Role of Diaphragmatic Plication

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Background: Diaphragmatic paralysis complicating cardiac surgery in children continues to occur with significant impact on morbidity.

Methods: From 2003 to 2007 our institution screened pediatric patients for phrenic nerve paralysis (PNP) following cardiac surgery. The diagnosis was suspected if difficulty was experienced in weaning the patient from the ventilator with respiratory failure. PNP was established by ultrasound screening of the diaphragm together with chest x-ray. Indications for placation were reintubation, failure to wean from ventilator, recurrent lung infection and persistent respiratory distress. Abnormal elevation of the hemidiaphragm was present in eight patients and a modified technique of transthoracic diaphragmatic plication was performed. Echocardiography was used to assess subsequent return of diaphragmatic function.

Results: Median age at diaphragmatic placation was 10.6 months. Median time from cardiac surgery to surgical placation was 12 days. Incidences of PNP were observed after Blalock-Taussig shunt, Fontan procedure, repair of coarctation and arterial switch. There were no deaths. All patients after placation were weaned from ventilation. Position of plicated diaphragm was normal in all patients.

Conclusion: Our method of transthoracic diaphragmatic placation is a simple and effective means of treatment for PNP and effectively reduced the duration of ventilation, morbidity and ICU stay.

Ligation of Patent Ductus Arteriosus for Premature Infants in the Intensive Care Units in the North of Israel

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Purpose: Patent ductus arteriosus (PDA) is common in preterm babies and persists in 15% to 80% of infants, depending on the gestational age and birth weight. The purpose was to review the results of ligation of patent ductus arteriosus in premature babies in an intensive care unit in the North of Israel.

Method: Retrospective review of premature babies who underwent ligation of patent ductus arteriosus in the intensive care units (Carmel Hospital, Bnai Zion Hospital, Ha'emek Medical Center, Western Galilee Hospital) during the period from December, 1984 to August, 2006.

Results: A total of 72 premature babies were recruited. 44 male and 28 female babies with a mean gestation of 25.7 weeks (ranged from 24 to 30 weeks) and a mean birth weight of 835 grams (ranged from 625 to 2650 gram) underwent ligation of patent ductus arteriosus via a left thoracotomy in the intensive units. The mean body weight at the time of operation was 1154 grams with a range of 570 to 3010 grams. The indications were respiratory failure and congestive heart failure. The babies were from 4 different hospitals. All except 18 babies had a trial of indomethacin induction for closure of patent ductus arteriosus (18 infants were operated before era of indomethacin treatment). The mean ductal size was 3 mm with a range of 2 to 5 mm. Until 1991 in-hospital-mortality in premature infants that underwent PDA closure was very high and reached 85% because lack of experience and technologies in treatment of this kind of patients. After 1991 only one patient died. There was no operative-mortality. Blood loss was minimal and there was no empyema or wound dehiscence. In two patients the operation was discontinued after exposure and recognition of additional congenital pathology.

Conclusion: Ligation of patent ductus arteriosus in the intensive units is safe and effective procedure. Risks, including hypothermia, encountered during transfer of preterm infants to the operating theatre can be avoided when patent ductus arteriosus is ligated in the intensive unit.

Impact of Red Blood Cell Transfusion on Clinical Outcomes in Patients with Acute Myocardial Infarction

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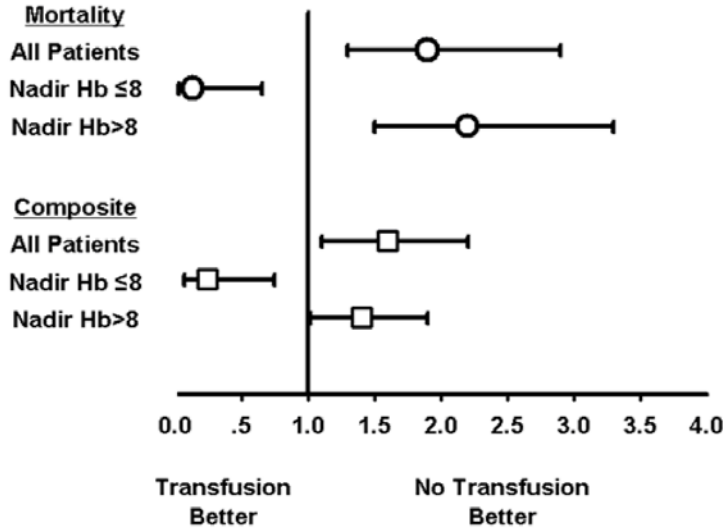
Background: There remain divergent views regarding the safety of treating anemia with red blood cell (RBC) transfusions in patients (pts) with acute coronary syndrome (ACS).
Methods: We used a prospective database to study the effect of RBC transfusion in pts with acute MI (n = 2358). Cox models were used to determine the association between RBC transfusion and 6-months outcomes. The models adjusted for baseline variables, propensity score for transfusion, and nadir hemoglobin (Hb) prior to the transfusion.
Results: One hundred and ninety two patients (8.1%) received RBC transfusion. Six-month mortality rates were higher in pts receiving transfusion (28.2% vs. 11.7%, $P<0.0001$). The adjusted hazard ratio [HR] for mortality was 1.9 in transfused patients (95% 1.3-2.9). There was a significant interaction between RBC transfusion and nadir Hb with respect to mortality ($P=0.004$). Stratified analyses showed a protective effect of transfusion in pts with nadir Hb ≤8 g/dL (adjusted HR 0.13, $P=0.013$; Figure). By contrast, transfusion was associated with increased mortality in pts with nadir Hb >8 g/dL (adjusted HR 2.2, $P<0.0001$). Similar results were obtained for the composite endpoint of death/MI/heart failure (P for interaction=0.04; Figure).
Conclusion: RBC transfusion in pts with acute MI and Hb ≤8 g/dL may be appropriate. The increased mortality observed in transfused pts with nadir Hb above 8 g/dL underscores the clinical difficulty of balancing risks and benefits of RBC transfusion in the setting of ACS.



Is the Increased Use of Coronary Angiography in Acute Coronary Syndromes Accompanied by a Survival Benefit?

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Objectives: Although the common practice of treatment of Acute Coronary Syndromes (ACS) includes coronary angiography (CA) with the intention to perform coronary revascularization, it is not clear whether such strategy is accompanied by a survival benefit in all age groups.

Methods: The study cohort comprised 5,398 patients with ACS derived from 3 prospective national surveys performed in 2000, 2002 and 2004 in all 25 CCU's operating in Israel. Baseline characteristics, hospital course, management and 1-year mortality were analyzed by 3 age groups: < 50 years old, 50-75 y.o. and > 75 y.o. and by the year of the index event of ACS. CA was used as a surrogate for mechanical revascularization enabling an intention to treat analysis. The association between in-hospital CA and 1-year mortality was assessed by the Cox regression analysis, adjusting for multiple factors known to influence the decision of performing CA as well as mortality.

Results: Baseline characteristics differed significantly between the 3 age groups as well as the rate of CA which significantly increased in each age group along the study period: the rate of CA in patients < 50 y.o. was 70%, 83.2% and 82.3% in 2000, 2002 and 2004, respectively. In the 50-75 y.o. patients these rates were 63.4%, 73.4% and 81.9%, respectively and 39.6%, 48.5% and 57.1% in the older group. The performance of CA was accompanied by a 1-year survival benefit within each age group; mortality was significantly lower in patients who underwent CA in comparison to counterparts who did not: HR=0.31 (95% CI 0.1-0.94, p=0.04) in the younger group, HR=0.5 (95% CI 0.38-0.65, p<0.0001) in the intermediate group and HR=0.54 (95% CI 0.42-0.71, p=0.0001) in the older group, reflecting the enormous differences between patients who underwent CA and those who did not. The increased use of CA was accompanied by a survival benefit only in the intermediate age group (mortality of 10.4%, 7.6% and 6.6%, in 2000, 2002 and 2004, respectively). However, no survival benefit was observed in the younger and the older groups. The over all 1-year crude cumulative mortality in 2000, 2002 and 2004 was 2.2%, 1.1% and 2.7% , respectively in the younger group and 27.8%, 24.5% and 26.2% respectively, in the older group (p=0.5, p for trend=0.6).

Conclusion: Patients with ACS who undergo CA during hospitalization have a better prognosis at 1-year. However, the increased use of CA in the treatment of ACS along the years was not accompanied by a change in 1-year survival in all age groups.

Acute Myocardial Infarction (AMI) and Pregnancy: Changes in Clinical Profile, Treatment, and Outcome

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Background: The published clinical profiles, treatments and outcomes of patients with AMI during pregnancy and the postpartum period were outdated.
Methods: Chart review of patients with documented pregnancy-related AMI before 1995 and between 1995-2006.
Results:

Variable	Before 1995 (*n*=125)	1995-2006 (*n*=103)
Mean age ±SD, *y*, range	33±6 (16–45)	33±5 (19–44
Anterior MI location, *n/n* (%)	89/122 (73)	73/94 (78)
Multiparous, *n/n* (%)	93/111 (84)	53/80 (66)
Hypertension, %	19	15
Diabetes mellitus, %	5	11
Smoking	26	45
Family history of MI, %	8	22
Hyperlipidemia	2	24
Preeclampsia, %	11	6
Elective cesarean section, %	14	19
Semielective/emergency cesarean section, %	12	19
Heart failure/cardiogenic shock after MI, *n* (%)	25 (19)	9
Coronary anatomy available, *n* (%)	68 (54)	96 (93)
Stenosis	29 (43)	41 (43)
Thrombus	14 (21)	8
Dissection	11 (16)	28 (29)
Spasm	1	2
Embolus	-	2
Normal	20 (29)	13
Intracoronary/systemic thrombolytic drug treatment for coronary thrombosis, *n* (%)	1 (1)	10 (9)
Percutaneous coronary angioplasty with or without stenting, *n/n*	1/58 (2%)	38/90 (42%)
Death, *n* (%)		
Mothers	26 (21)	11 (11)
Infants	16 (13)	6

Conclusions: Pregnancy-related AMI occurs mostly in multiparous women. AMI is anterior in >70% cases. Coronary dissection is responsible in ~30% cases. Patients diagnosed between 1995-2006 had a higher incidence of diagnostic cardiac catheterization and treatment (coronary reperfusion by either thrombolytic therapy or percutaneous intervention) and significantly better outcome (lower rate of cardiogenic shock and less maternal and fetal mortality) than those diagnosed before 1995.

Incidence, Predictors and Outcome of Upper Gastrointestinal Bleeding in Patients with Acute Coronary Syndromes

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Background: The broad utilization of revascularization and antithrombotic drugs has led to improved outcome of patients with acute coronary syndromes (ACS). Nevertheless, these strategies are associated with a substantial risk of bleeding, which is associated in turn with increased mortality. Most bleeding episodes are related to arterial punctures. The characteristics and outcome of patients who develop upper gastrointestinal (UGI) bleeding in this setting have received little attention.

Methods: Using computerized databases we identified all patients admitted to our center between 5/97 and 11/07 for an ACS who developed UGI bleeding during their hospital stay. For each case we randomly selected 3 control cases that were matched for age, gender, ACS subtype and the use of lytics. Multiple relevant baseline characteristics, as well as antithrombotic agents, revascularization strategy, endoscopy reports and 30-day mortality were recorded.

Results: 7690 patients were hospitalized in our ICCU during the study period, of whom 64 (0.8%) developed UGI bleeding, with a majority of male gender (72%). Endoscopy was performed in 35 of them. Patients with an upper GI bleeding tended to be older (67±12 vs. 64±11, $p=0.06$). There were no significant differences between groups in diabetes and other risk factors, revascularization strategy, the use of anti platelet agents and the type of ACS. Patients who bled were more frequently treated with unfractionated heparin, either alone (20% vs. 3%, $p<0.001$) or combined with LMWH during the same hospital stay (36% vs. 15%, $p<0.001$). Conversely, enoxaparin was used much less frequently in patients who bled (23% vs. 58%, $p<0.001$). Patients who developed UGI bleeding had a substantially higher 30-day mortality rate (34% vs. 5%, $p<0.001$). Among patients for whom endoscopy was available the source of bleeding was similarly distributed between the esophagus, stomach and duodenum. Gastritis and duodenitis were the most common findings.

Conclusions: Upper GI bleeding occurring in patients with ACS carries a very high risk of mortality. The use of unfractionated heparin rather than enoxaparin was associated with a substantial risk for this morbid complication.

Clinical Characteristics and Mortality Outcome of ACS Patients Treated with Bare Metal vs. Drug Eluting Stents: Insights from the National ACSIS-2004 and ACSIS-2006 Registries

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Background: The use of drug eluted stents (DES) in patients with acute coronary syndrome (ACS) which is primarily due to coronary atherothrombosis remains a topic for ongoing clinical investigation and mortality data are still awaited.

Methods: We investigated the pattern of DES vs. bare metal stents (BMS) utilization during the course of ACS in the ACSIS (Acute Coronary Syndrome Israeli Survey) 2004 and 2006 registries. We compared the baseline characteristics and short-term outcomes among the two surveys in patients who underwent PCI using either DES or BMS during or soon following the course of ACS (e.g. unstable angina, non-STEMI and STEMI). Major clinical characteristics and mortality outcomes up to 30 days were analyzed.

Results: DES utilization during the course of ACS approximately *doubled* between 2004 (16.7%) and 2006 (36.1%). The main demographic and short-term mortality results are shown in the **Table** as follow:

	ACSIS 2004		ACSIS 2006	
	DES (n=163)	**BMS (n=812)**	**DES (n=431)**	**BMS (n=763)**
Men	77	78	82	81
Age (yrs)	63.6±12*	61.3±12	61.5±12	61.8±12
Diabetes (%)	31	27	34*	26
STEMI (%)	39*	64	32*	68
Non-STEMI (%)	61*	36	68*	32
Killip Class ≥2 (%)	16	16	14	13
PCI as Primary mode of reperfusion	21*	56	30*	75
Mortality data @30 day (%)	1.2	3.5	2.8	3.2

** Statistical significant difference comparing DES to BMS groups ($p \leq 0.05$)*

Using a logistic regression analysis model, the patient's age (by 10 years increment) was the most powerful independent predictor for one month morality (OR=1.96 in ACSIS-2006 and OR=1.77 in ACSIS-2006, $p<0.05$ for both) while STEMI presentation emerged as an independent predictor for short-term mortality in ACSIS-2006 (OR=1.80, $p<0.05$) and regardless of the stent category being utilized (i.e. DES vs. BMS).

Conclusion: In Israel, the prevalence of DES utilization during the course of ACS is increasing (from 2004 to 2006) mainly among the non-STEMI patients. The short-term mortality is primarily afflicted by patients' age and STEMI clinical presentation rather by the stent type (i.e. DES vs. BMS) being utilized and long-term data are still awaited.

Coronary Computed Tomography Angiography: Evaluation of Patients in the Chest Pain Unit

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Background: 64-slice coronary CT angiography (CCTA) is established as a reliable tool in diagnosing coronary artery disease (CAD). Data regarding its utilization in the chest pain unit (CPU) are scarce.

Methods: 618 patients were admitted to the CPU during 5/2006-5/2007. 52 pts were hospitalized before performing any non-invasive test for evidence of myocardial ischemia. Of the remaining 566 patients, 232 underwent CCTA, 68 underwent stress echocardiography, and 266 underwent SPECT imaging. Exclusion criteria for CCTA: creatinine >1.4mmol/l, weight >130kg and known history of CAD. CCTA scans were performed using a 64 slice scanner (Brilliance, Philips) using beta blockers for heart rate control.

Results: CCTA findings were: normal in 142 (61%); non-obstructive CAD in 56 (24%) and technically suboptimal in 19 (8%) Coronary bridging was demonstrated in 110 patients and coronary anomalies in 3. 22 patients were referred to catheter coronary angiography (CCA) for coronary stenosis ≥70% (16/22) or for suspected stenosis, but with suboptimal imaging (6/22). Significant stenosis necessitating intervention was confirmed in 11/22 patients with >70% stenosis at CCTA and in none of the 6 patients with suspected stenosis, but with suboptimal imaging. 198 patients with normal or non-obstructive CAD were discharged without further investigation. A four-month follow-up was completed in 132 (56%) patients. During this period, none of the patients had acute coronary syndrome, did not undergo coronary intervention and/or die.

Conclusions: CCTA is a powerful tool for the exclusion of CAD in fast-track evaluation of chest pain patients. CCTA may be employed for non-invasive triage of patients with chest pain.

Modulated AC Current Defibrillation–A New, Equally Effective Method to DC Defibrillation

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Background. Defibrillation is the only clinically effective treatment of ventricular fibrillation. Early defibrillation improves the outcome and increases the chance of survival with full recovery. Immediate availability of a home-based defibrillator using mains-derived AC current will drastically improve outcome.

Aim. To develop a defibrillator based on modulated AC current, resembling biphasic configuration and compare its efficacy, in a pig model to a standard DC defibrillator.

Methods: A Computer controlled, modulated AC defibrillation system was developed using a High Voltage Switch and a High Voltage Transformer. The efficacy and safety was evaluated in 5 pigs (30-40 Kg), under general anesthesia with ketamin and isoflouran. A single quadripolar-pacing catheter was inserted percutaneously, VF was induced with rapid ventricular burst pacing and stable VF was defibrillated after 15 seconds.

DFT was determined in each animal with AC and standard DC shock using step-down protocol.

Results: The DFT with AC was 70.83±24.81 Joules and with DC was 65.83±12.41 Joules (p=0.49, Fisher Exact Test). The shock configuration is shown in the figure. No damage was observed after AC or DC defibrillation.

Conclusions: Modulated AC defibrillation is safe and effective as the commercially available DC defibrillation. The defibrillator is built from inexpensive High Voltage Transformer, without need for capacitor, batteries or routine maintenance, delivers repeated shock without any delay and provide pacing as well. It may be an ideal platform for automatic home defibrillator.

Excellent Long-Term Reproducibility of the Electrophysiologic Efficacy of Quinidine in Patients with Idiopathic Ventricular Fibrillation or Brugada Syndrome.

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Background. For almost 3 decades, our group has shown the extraordinary efficacy of quinidine in preventing the re-induction of sustained ventricular tachyarrhythmias during electrophysiologic study (EPS) in patients with idiopathic VF or Brugada syndrome. However, there are no data on the long-term reproducibility of this efficacy.

Methods. From 1979 to 2007, 76 patients with no obvious heart disease and inducible sustained VF at baseline underwent EPS on quinidine sulfate (Quiniduran*). In 71 (93.4%) of these patients, quinidine prevented re-induction of sustained ventricular tachyarrhythmias. Nine of these 71 patients underwent another EPS after 1.7 to 23.6 (9.8+6.8) years of quinidine therapy (> 5years in 8/9 patients). In 1 of 9 patients, this EPS was performed on hydrochloride quinidine (Serecor*). In 7 of the 8 patients who underwent initial and repeat EPS on the same quinidine salt, identical drug dosages were tested. Two patients underwent two late EPS on quinidine; one pt 5 years and 8 years and the other 5 years and 8 years after the initial drug study. The goal of repeat EPS on quinidine was to ensure persistent long-term drug efficacy (n=6 patients) or to elucidate the reason of syncopal episodes during therapy (n=3 patients). The protocol of programmed ventricular stimulation significantly evolved over the years as it became more aggressive (more pacing sites and/or more ventricular extrastimuli).

Results. There were 7 males and 2 females, aged 21-72 (40+16.5) years at initial EPS. Eight patients had cardiac arrest with documented VF and 1 had recurrent syncope of unknown cause. Five patients had idiopathic VF and 4 had Brugada syndrome. All 9 patients well tolerated the medication during long-term therapy and had no recurrent documented arrhythmic events during follow-up. No sustained ventricular tachyarrhythmias could be induced in any patient during repeat late EPS. In 3 patients, more aggressive extrastimulation (triple) could be tested at repeat EPS while only double extrastimulation was applied at the initial EPS.

Conclusion. Our results showed an excellent long-term reproducibility of the EP efficacy of quinidine in patients with idiopathic VF or Brugada syndrome and inducible VF. This suggests that EP-guided quinidine therapy represents a valuable long-term alternative to ICD therapy for these unique types of malignant idiopathic ventricular tachyarrhythmias.