

## Does the U.S. Economy Impact Hand Surgery Volume? A 17-year Comparison Between Orthopaedic and Plastic Surgeons

Institution where the work was prepared: The Cleveland Clinic, Cleveland, OH, USA

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**INTRODUCTION:** With the recent economic recession, there has been a significant decrease in surgical volume nationwide across multiple subspecialties. Scarce literature exists as to the correlation of the U.S. economy and hand surgery volume. The objective of this study was to examine our institution's hand surgery volume, as represented by carpal tunnel release (CTR) volume, over the last 17 years in relation to the three major U.S. markets, as a reflection of the U.S. economy.

**METHODS:** We performed a retrospective analysis of our institution's CTR volume between January 1992 and October 2008 for both surgical departments (orthopaedic and plastic). Liposuction and breast augmentation volume served as aesthetic surgery controls. Pearson correlation statistics were used to estimate the relationship between the number of CTRs and aesthetic surgeries performed in relation to the three major indices (DOW, NASDAQ, and S&P500) of the same and the preceding quarters of the fiscal year.

**RESULTS:** A combined total of 7884 patients were identified over a 17-year period. Within the departments of plastic and orthopaedic surgery, there were 1927 (24%) and 5957 (76%) patients, respectively (Table 1). For the plastic surgery department, there was a statistically-significant negative correlation (i.e. inverse relationship) between CTR volume and all three market index trends, while the volume of liposuction and breast augmentation showed a significant positive correlation ( $p < 0.02$ ). For the orthopaedic department, there was a significant positive (i.e. parallel relationship) correlation between the market indices and CTR volume ( $p < 0.001$ ). All four fiscal quarter delays evaluating market index shifts and subsequent hand surgery volume, ranging from one to four, were also statistically-significant for both plastic and orthopaedic surgeons ( $p < 0.001$ ).

**CONCLUSION:** This study demonstrates a statistically-significant negative correlation between hand surgery volume performed by plastic surgeons and the U.S. economy. In contrast, orthopaedic hand surgery volume and the markets showed a statistically-significant positive correlation, meaning that they mirror each other both during upward and downward trends of the U.S. economy. In addition, the effects of the stock market trends on hand surgery volume remained statistically constant for all four fiscal quarter delays for both specialties. These findings could be explained by plastic surgeons shifting their emphasis towards aesthetic surgery and away from hand cases during strong economic times, and vice versa during times of recession. If substantiated, this data may assist both plastic and orthopaedic departments preemptively in budgetary planning and operating efficiency as a predictor of future volume. ■

## Perspectives on Hand Transplantation: Knowledge and Attitudes of an Expert Group

Institution where the work was prepared: University of Western Ontario, London, ON, Canada

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**BACKGROUND:** Since the inception of upper extremity composite tissue transplantation in 1998, over fifty limbs have been transplanted worldwide. Prior to its evolution into a standard reconstructive option, consensus and wider acceptance of the procedure within the reconstructive surgery community will be necessary.

**PURPOSE:** To determine the current knowledge and attitudes of an expert group of reconstructive surgeons about upper extremity transplantation.

**METHODS:** An internet-based survey was generated and distributed electronically to members of a national society of plastic surgeons. The survey questions and four clinical vignettes served to assess respondent's knowledge of the functional outcome of hand transplantation, the risks of immunosuppression, and their attitudes and willingness to consider it as a reconstructive option. Data were obtained on years in practice, academic vs community practice, and portion of practice devoted to hand surgery. In addition, knowledge based questions on numbers of transplants completed, "success" rates, and functional outcomes were completed. The clinical vignettes assessed the respondent's attitudes and willingness to consider transplantation as a reconstructive option. Comparative data were generated based upon respondents' answers.

**RESULTS:** Eighty-six surgeons responded and just over half (58.8%) worked in an academic setting. 79.8% of respondents had practices containing a significant portion (>20%) of hand surgery. Nearly 2/3 of surgeons significantly underestimated the number of upper extremity transplants completed and only 25.9% correctly identified the rate of successful transplants. The majority of respondents felt that the functional outcomes of unilateral, below-elbow transplant and a unilateral below-elbow prosthesis were equivalent (77.5% vs 91.1%,  $p = 0.028$ ) however, more felt that a bilateral below-elbow transplant was superior to bilateral prostheses (81% vs 44%,  $p = 0.0045$ ). Only a minority (22.8%) thought the risks of immunosuppression were acceptable in unilateral amputees vs a majority (61.5%) for bilateral amputees. However, a majority (70.5%) felt that a "fully informed patient" should be able to make the decision to proceed with transplantation autonomously. When comparing the acceptability of renal transplantation that conferred no survival benefit to the acceptability of either unilateral or bilateral below-elbow transplantation, the majority (78.5%) thought that the risks of renal transplantation were acceptable whereas only 32.9% considered the risks acceptable for a unilateral upper extremity transplant ( $p < 0.0001$ ).

**CONCLUSIONS:** These data suggest that there remain significant misconceptions concerning upper extremity transplantation even amongst expert groups. Biases may continue to exist that hamper the acceptance of transplantation as a reconstructive option. ■

## The Addition of an Upper-Extremity Curriculum in Medical School Education and Its Assessment

Institution where the work was prepared: Harvard Medical School, Boston, MA, USA

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**INTRODUCTION:** A previous study in the 2005-2006 academic year assessing knowledge and skill in the musculoskeletal system revealed a specific deficiency in upper-extremity musculoskeletal knowledge among medical students at our institution. The purpose of this study was to identify the previous upper-extremity curriculum, lobby for and administer additions to the curriculum, and re-assess students in the 2007-2008 academic year, following implementation of the new curriculum.

**METHODS:** This study was carried out in two stages. In the first stage, upper-extremity objectives were integrated into the musculoskeletal preclinical curriculum by identifying the previous upper-extremity curriculum, then lobbying for additional course hours and faculty recruits, followed by the design and implementation of a new upper-extremity curriculum.

The second stage of this study was the assessment of the new upper-extremity curriculum. Second-year medical students' were assessed using a subjective survey and a nationally validated objective musculoskeletal exam. Independent sample t-tests were used to compare the scores on the overall and upper-extremity portion of the examination, and clinical confidence levels in the upper-extremity between the second-year medical students of the 2005-2006 and 2007-2008 academic years.

**RESULTS:** The previous upper-extremity curriculum comprised of 7.25 class hours across three preclinical courses: a first-year anatomy course, and second-year pathophysiology and clinical skill courses. 7.5, 3, and 3.5 upper-extremity hours were added to the anatomy, pathophysiology, and clinical skills courses, respectively. The new upper-extremity curriculum contained 21.25 hours across the three preclinical courses, a 3-fold increase in class hours.

The response rate in the 2007-2008 assessment was 67% (90/135). There was a statistically significant increase in students' clinical confidence in the physical examination of the hand and wrist. There was also a small increase in confidence levels in providing differential pain diagnoses of the hand/wrist, and shoulder regions, as well as in the scores of both the overall and upper-extremity exam questions. Students also reported higher levels of satisfaction with the amount of time allocated for the musculoskeletal system after the implementation of curricular changes.

**CONCLUSION:** An inadequate focus on upper-extremity education has been demonstrated at our institution, through medical students' lack of knowledge and skill in this area. When students were exposed to more upper-extremity material, clinical confidence in physical examination of upper-extremity anatomy increased significantly. Curricular reform is viable and can be effective after the first year of implementation at our institution, although further refinement will be necessary. ■

## Case-Controlled Peri-operative Bone-Marrow Mediated Fibrocyte Function in Patients with Dupuytren's Contracture

Institution where the work was prepared: University of Virginia, Charlottesville, VA, USA

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**BACKGROUND:** The pathophysiology of Dupuytren's contracture has been attributed to local fibroblast function, with early Dupuytren's nodes demonstrating a pathologically increased number of fibroblasts, which later decrease with cord formation. Bone-marrow derived fibroblast precursors (fibrocytes) have been demonstrated to cause regional fibrosis in disorders such as pulmonary fibrosis and keloids by trafficking to high concentrations of stromal-derived factor-1 (SDF-1) in plasma and then to target tissue. We theorize that a similar mechanism explains Dupuytren's contracture and that the palmar fibrosis represents a focal manifestation of a systemic condition.

**METHODS:** Blood specimens were taken post-operatively from patients undergoing selective fasciectomy for Dupuytren's contracture and control patients undergoing elective hand surgery where palmar aponeurosis specimens could be excised. Circulating fibrocyte levels were identified by triple-staining the buffy coat of blood specimens for CD45, collagen I and CXCR4 and performing FACS analysis. Plasma SDF-1 levels were measured by ELISA to determine if a systemic chemotactic gradient existed. SDF-1 levels of Dupuytren's cords were compared to control palmar aponeurosis.

**RESULTS:** Five Dupuytren's patients and 12 control subjects were enrolled in the study. Fibrocyte levels of patients with Dupuytren's contracture ( $53 \times 10^4$  cells/mL) were significantly greater than control ( $5.5 \times 10^4$  cells/mL,  $p < 0.01$ ). Circulating SDF-1 levels for patients with Dupuytren's contracture averaged 1685pg/mL which was significantly greater than control patients 261pg/mL ( $p < 0.001$ ). Dupuytren's cords however expressed SDF-1 only slightly greater (141pg/mL) than uninvolved palmar aponeurosis from control patients (23.5pg/mL) which was not significantly different.

**CONCLUSIONS:** Dupuytren's contracture is a focal expression of a systemic disorder as evidenced by a significantly greater number of circulating fibrocytes and systemic chemotactic ligand SDF-1 when compared to control patients. As expected from earlier pathology studies, Dupuytren's cords are largely quiescent in their clinically advanced form with only a marginally elevated SDF-1 concentration compared to uninvolved palmar aponeurosis. Elevated SDF-1 levels in early Dupuytren's nodules would confirm that focal inhibition of fibrocyte chemotaxis to the palm would prevent pathologic contracture without systemic toxicity. ■