

Semi-Automated Medical Data Extraction and Analysis

Prediction of Post-Endograft Surgery Complications

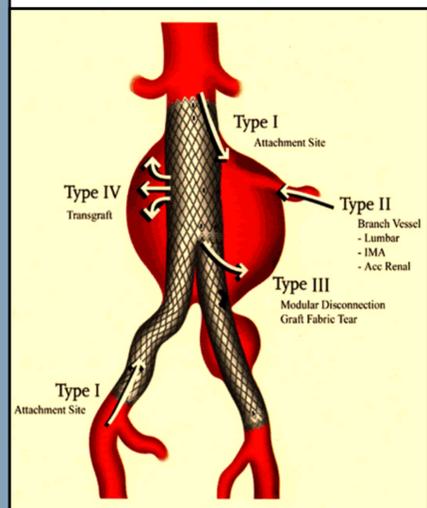
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INTRODUCTION

An abdominal aortic aneurysm (AAA) is a condition in which the aorta swells and is at risk of rupturing. This can be treated by endograft surgery, which inserts a fabric around the artery to stop further swelling. Potential post-surgery complications include "endoleaks."



- Type II endoleaks in 40% of endograft patients
- About half of endoleaks require intervention
- Few endoleak risk factors identified
- Medical data analysis can be difficult

Semi-automated analysis of extensive medical data could:

- Help utilization by medical community
- Reveal risk factors of post-graft endoleaks

RESEARCH GOALS

- Efficiently analyze medical data
- Contribute to prediction of endograft surgical outcomes
- Find risk factors for the occurrence and/or persistence of endoleaks

METHODOLOGY

- Used 306 records of patients with abdominal aortic aneurysm surgical repair
- Used a variety of software applications to support data analysis (Figure 1)
- Confirmed risk factors with statistical analysis



Figure 1: Software used in analysis

RESULTS

- Top terms in Piranha: pulmonary, fibrillation, diabetes, hypertension, coronary, smoking, and hernia
- Most top conditions occurred more often in endoleak patients

Figure 2. Endoleak patients sorted 'potential,' 'unresolved,' and 'resolved.' Majority of patients are 'no endoleak.' Majority clustered under 'fibrillation' are endoleak patients.

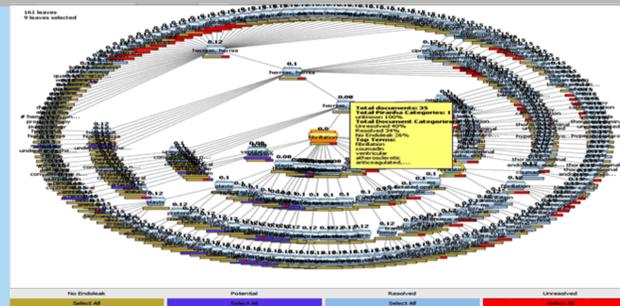


Figure 3. 'Fibrillation' was top word in 'unresolved' and 'resolved' endoleak patients

Figure 4. 'Fibrillation' not top word in 'potential' or 'no endoleak' patients

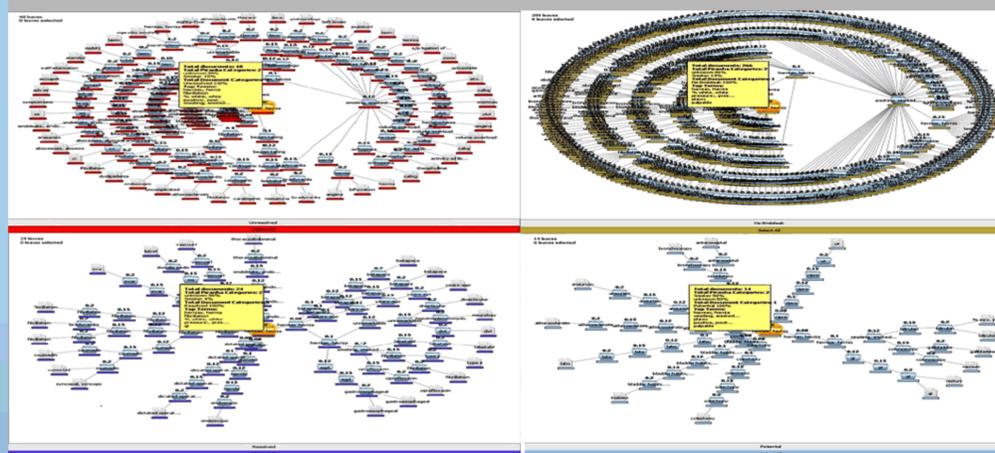
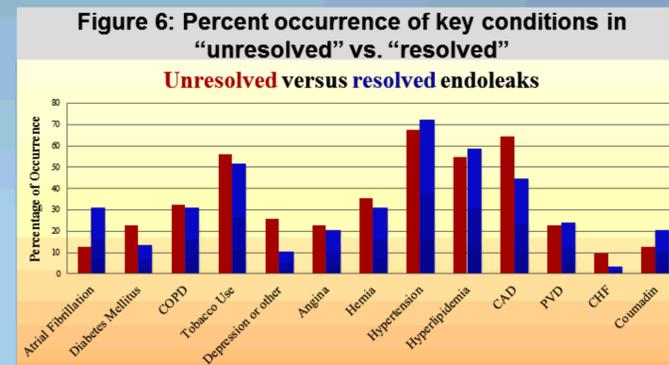
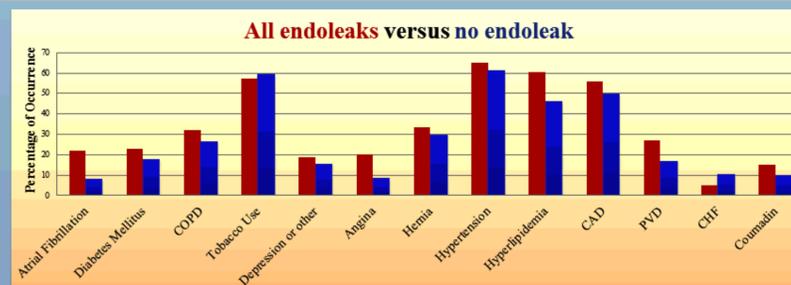
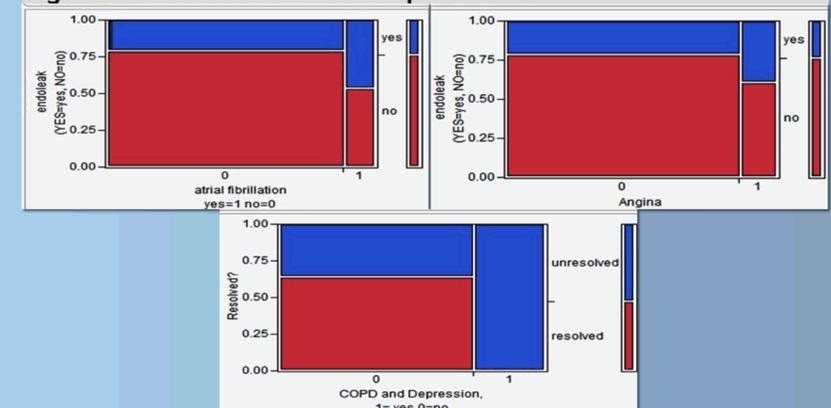


Figure 5: Percent occurrence of key conditions in "endoleak" versus "no endoleak"



Chi-square test results: atrial fibrillation ($P = .0049$) and angina ($P = .011$) are significant endoleak risk factors
Depression with chronic obstructive pulmonary disease ($P = .03$) is significant risk factor of endoleak persistence



CONCLUSIONS

- Endoleak risk factors found include atrial fibrillation and angina.
- Risk factors of endoleak persistence include occurrence of COPD with depression.
- Research has impacts on quantitative measures for evaluation of outcomes and quality of care.

FUTURE RESEARCH

- Expand research with larger patient base
- Find definitive predictors for post-graft repair endoleaks
- Develop a standard, systematic method to quickly utilize and analyze medical information

Bibliography
(1) Ghali, Zohran (2010) Analyzing Endoleaks and Predicting Outcomes after Aneurysm Repair. Retrieved from <https://www.researchgate.net/publication/312544444-Analyzing-Endoleaks-and-Predicting-Outcomes-after-Aneurysm-Repair>
(2) Heek, (2008). Endovascular Treatment of Abdominal Aortic Aneurysms and Type II Branch Vessel Endoleaks. Presentation on behalf of Endovascular Cooperation at UT Medical Center, Knoxville, TN.
(3) Hirsch et al. (2008). ACC/AHA Guidelines for the Management of PAD. Downloaded from <http://circ.ahajournals.org/> on February 14, 2011. pii: 844-854.
(4) Kromann, C. L., and Patel, M. A. (2007). Fluid-Structure Interaction Analysis of Stented Abdominal Aortic Aneurysms. Ann. Rev. Biomed. Eng. 2:159-204.
(5) Patton, Beckerman, Potos, Travell, (2011). Genetic Algorithm for analysis of Abdominal Aortic Aneurysms in Radiology Reports. Accepted for Presentation at 11th IEEE Conference on Healthcare Informatics, Imaging and Systems Biology, San Jose, CA, July, 2011.
(6) Patton, Rojas, Beckerman, Potos. (2010). A Computational Framework for Search, Discovery, and Trending of Patient Health in Radiology Reports. Proc. of the 9th IEEE Workshop on Medical Applications of Genetic and Evolutionary Computation in Conjunction with the 2010 Genetic and Evolutionary Computation Conference (GECCO 2010).
(7) Upchurch, Schaub (2008). Abdominal Aortic Aneurysm. American Family Physician. www.ama-assn.org, Vol 77, number 7, April 1, 2008