Efficacy of CT Enterography in the Detection of Active Inflammatory Crohn’s Disease of the Terminal Ileum

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Purpose and Rationale

This project aims to improve the accuracy of CTE interpretation for the diagnosis of active inflammatory Crohn’s Disease of the terminal ileum.

CTE is now considered a method of choice in the evaluation of patients with suspected Crohn’s disease. Thus, improving diagnostic efficacy of CTE in this disease is important. There are multiple sources of interpretive error:

- collapsed loops enhance to a greater degree than distended loops
- proximal small bowel enhances to a greater degree than distal small bowel, given a greater surface area
- ignorance of the important findings of active inflammatory disease, including wall thickening, wall hyperenhancement (often with stratification), vasa recta engorgement (Comb sign), fatty proliferation.

Further, while it has been shown that capsule endoscopy and CTE are complementary examinations, many sites do not use capsule endoscopy as a primary means for diagnosing Crohn’s disease. Strictures may obstruct the capsule leading to unnecessary or undesirable surgery.

Resources


These and other investigations have established that CTE should detect active inflammatory Crohn’s disease of the terminal ileum with sensitivity of 80-90%, using ileocolonoscopy/biopsy, and between 89-98% using a comprehensive, clinical reference standard.

**Measures**

Rates of CTE studies that are:

- true positive (interpreted as positive, confirmed by ileocolonoscopy and/or biopsy)
- true negative (interpreted as negative, confirmed by ileocolonoscopy and/or biopsy)
- false positive (interpreted as positive by CTE but negative by ileocolonoscopy and/or biopsy)
- false negative (interpreted as negative by CTE but positive by ileocolonoscopy and/or biopsy)
- equivocal

You may have to substitute a clinical reference standard if endoscopy and/or biopsy are unavailable.

**Collecting Baseline Data**

Depending upon the size and composition of your patient population, collect 25-50 CTE reports with confirmatory ileocolonoscopy. From among those performed within the study period, you may choose to use consecutive cases; every second, third or fourth case until the target number have been selected; all of the cases done on a specific day or set of days; or any other strategy that will result in a set of the target number of cases identified at random. Categorize the CTE report findings as: definitely positive for active inflammatory Crohn’s of the TI, definitely negative for active inflammatory Crohn’s disease, and equivocal.

Then, access colonoscopy and biopsy reports for the same cases. Categorize the cases based on these findings as definitively active inflammatory Crohn’s disease, equivocal and inactive/absent, using the criteria established by Bodily et al (Radiology 2006; 238: 128).
Baseline Data Analysis

Create a 3 x 3 table:

<table>
<thead>
<tr>
<th></th>
<th>Scope/biopsy Positive</th>
<th>Scope/biopsy Negative</th>
<th>Scope/biopsy Equivocal</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTE Positive</td>
<td>True Positive</td>
<td>False Positive</td>
<td></td>
</tr>
<tr>
<td>CTE Negative</td>
<td>False Negative</td>
<td>True Negative</td>
<td></td>
</tr>
<tr>
<td>CTE Equivocal</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sort the cases into their appropriate boxes.

Data should be evaluated in the aggregate for the practice and, if numbers allow, by individual radiologist.

In particular, determine if your practice’s efficacy is equivalent to published standards (at least 80% sensitive for active inflammatory Crohn’s disease of the terminal ileum).

Factors that Can Influence Performance

After analyzing the baseline data, determine where there is room for improvement. Analyze the false positive and false negative cases, as well as those cases with equivocal findings on CTE that were judged to be definitive by ileocolonoscopy and/or biopsy. Look for any patterns of contributing factors. If your rates are not equivalent to published standards, try to determine why. Are there too many equivocal readings? If so, why are they equivocal? Is it missed findings?

Reflect on your setting and practice, and identify factors that may have influenced your results. Design an intervention to address these factors.

The most likely intervention is an education program for your interpreting radiologists to increase their understanding of CTE findings of active inflammatory Crohn’s disease. Potential educational interventions might include grand rounds, educational resources available through professional societies, journal discussion groups, or visits to sites of excellence.

If certain radiologists have better performance statistics, consider whether studies should be selectively interpreted by those members of your practice.

Post-Intervention Data Collection and Analysis

Plan to collect data again at a set interval —three to six months after baseline or the intervention
if there is a time lag for education—and then at specified intervals thereafter for the duration of
the project (one to three years is typical).

Make sure that cases are collected, tallies are performed and metrics are analyzed the same way
as at baseline. The only exceptions to this would be to adjust the number of cases collected if
more cases are needed for analysis or to correct a problem identified with the baseline data
collection procedure. If so, once the procedure has been corrected use it consistently going
forward.

The process is iterative and should be repeated at frequent intervals until steady state is reached.
Special attention should be given to those radiologists who are more likely to interpret a CTE as
equivocal to determine whether intervention has made a difference. It is important to determine
if the quest for improving sensitivity has inappropriately altered accuracy.

Data should continue to be collected over time. If improvement is continuing, the same intervals
for data collection should be recommended. As improvement plateaus the interval for measuring
and the number of exams that are measured can be reduced—as long as the metrics are stable. If
a significant decrease in performance is seen, the project should start anew with analysis as to
cause and potential fix.

You may want to make a chart or graph of your performance over time to identify trends and
patterns. Review the data with your project team after every data collection period.

If you are meeting your goals, no further changes may be necessary. However, you should plan
to take steps to institutionalize whatever changes contributed to successful performance. If
additional improvement is possible, look at your processes again and design additional
interventions. It is generally best to only make one intervention per study cycle so that
conclusions can be drawn about what caused the observed effect.