Objective: To determine whether hyperbaric oxygen (HBO) therapy is an effective adjunct treatment for hypoxic wounds.

Methods: We identified studies from technology assessment reports on HBO and a MEDLINE search from mid-1998 to August 2001. We accepted randomized controlled trials (RCTs), cohorts, and case series that reported original data, included at least 5 patients, evaluated the use of HBO for wound care, and reported clinical outcomes. Demographics, wound conditions, HBO regimen, adverse events, and major clinical outcomes were extracted from each study.

Results: Fifty-seven studies, 7 RCTs, 16 nonrandomized studies, and 34 case series involving more than 2000 patients are included in this review. None of the studies used wound tissue hypoxia as a patient inclusion criterion. The study results suggest that HBO may be beneficial as an adjunctive therapy for chronic nonhealing diabetic wounds, compromised skin grafts, osteoradionecrosis, soft tissue radionecrosis, and gas gangrene compared with standard wound care alone. Serious adverse events associated with HBO include seizures and pressure-related traumas, such as pneumothorax. A few deaths in the studies were associated with these adverse events.

Conclusions: The overall study quality is poor, with inadequate or no controls in most studies. The studies suggest that HBO may be helpful for some wounds, but there is insufficient evidence to ascertain the appropriate time to initiate therapy and to establish criteria that determine whether patients will benefit. Serious adverse events may occur. High-quality RCTs that evaluate the short- and long-term risks and benefits of HBO are necessary to better inform clinical decisions.

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related traumas (eg, barotraumatic otitis, pneumothorax) and adverse effects due to oxygen toxicity (eg, myopia, seizures). Some patients may experience claustrophobia due to the confined space of the treatment chambers. Most adverse events are self-limiting and resolve after termination of therapy. Patients with barotraumatic otitis may require the placement of tympanostomy tubes. Some centers routinely insert tympanostomy tubes prophylactically. Serious, life-threatening events are probably rare but not well quantified.

Ten specific categories of wounds are considered in this review: acute traumatic peripheral ischemia; crush injuries and suturing of severed limbs; acute peripheral arterial insufficiency; compromised skin grafts; osteoradionecrosis; soft tissue radionecrosis; gas gangrene; progressive necrotizing infections; chronic refractory osteomyelitis; and chronic nonhealing wounds.

The following questions are addressed:

- Is there sufficient objective evidence that the use of HBO as adjunctive therapy to standard wound care aids in wound healing? Also, what other treatment modalities must be employed along with HBO therapy to maximize therapeutic benefits?
- At what point in treatment should HBO therapy be introduced?
- Wounds are generally classified based on diagnosis. Could wounds be classified based on a level of “hypoxia” rather than on diagnosis?
- Are there useful criteria to determine when an individual is likely to benefit from HBO therapy or when an individual will be nonresponsive to HBO therapy?
- Are there absolute contraindications when considering HBO therapy in monoplace or multiplace chambers?
- Which method of measuring tissue oxygen is most reliable and lends itself to standardization?
- What are the adverse effects of HBO therapy?

**METHODS**

**LITERATURE SEARCH**

There have been several systematic reviews on the role of HBO in the treatment of certain conditions examined in this review.\(^1,38-44\) We updated the literature used in the existing systematic reviews by conducting a MEDLINE search for articles published between mid 1998 to August 2001. We searched for human subject studies published in English on HBO for wound care using the search terms “hyperbaric oxygen” and “wound” or “injur”\(^2\). This search yielded 159 citations. We also searched for articles that measured tissue oxygen levels in conjunction with HBO therapy using search terms of “hypoxia” and “anoxia”; this search yielded 149 citations. We also included articles suggested by expert reviewers.

**SELECTION OF PRIMARY STUDIES**

We considered only published articles that reported original data, included at least 5 human subjects, evaluated the use of HBO for wound care, and reported clinical outcomes. Acceptable clinical outcomes included, but were not restricted to, mortality, amputation, wound healing, duration of hospitalization, and infection control. We included randomized controlled trials (RCTs), nonrandomized comparison studies, and case series. Conference reports that did not provide primary data, animal studies, and review articles were excluded.

**REPORTING OF RESULTS**

We assessed the characteristics of the original research articles and their results. We extracted the following data from each original study and summarized this information: patient demographics, description of the conditions, diagnostic criteria, wound duration, measurements of tissue oxygen levels around the wound, study design, adverse effects of treatment, and major clinical outcomes.

There were several nonrandomized prospective controlled trials. In some of these nonrandomized trials, patients who refused HBO because of claustrophobia or patients with contraindications served as controls. Most studies were retrospective reviews of patient series and compared the results of patients treated with HBO with those not treated with HBO. This group of studies was labeled “retrospective comparison.” We labeled the specific diagnostic criteria as “clinical” for studies that did not report them.

**RESULTS**

Table 1 presents the characteristics of the studies that we evaluated. There were a total of 57 studies, 7 RCTs, 16 nonrandomized comparison studies, and 34 case series that studied a total of 2070 patients (1 study did not report the number of subjects). Only 8 studies used measurements of tissue oxygen to define hypoxia. The number of HBO therapy sessions varied from 4 to 44 sessions. No studies included patients with acute peripheral arterial insufficiency. We describe the findings of the studies for the 9 remaining conditions. Table 2 presents a summary of the overall effects of HBO on each of the conditions.

**ACUTE TRAUMATIC PERIPHERAL ISCHEMIA**

One case series of 23 patients addressed this condition.\(^45\) In this study, all of the patients who received adjunctive HBO therapy had improved wound recovery and complete healing. Tissue oxygen levels \((\text{PtcO}_2)\) were measured under 3 successive conditions: the patient breathing normal air, the patient breathing normobaric pure oxygen by facial mask, and the patient breathing pure oxygen at 2.5 ATA. The overall sensitivity and specificity for predicting the limb’s final outcome, when the ratio of \(\text{PtcO}_2\) in traumatized and nontraumatized limbs is less than 0.40 at 2.5 ATA of pure oxygen, are 100% and 94%, respectively. The study concluded that the comparison between transcutaneous oxygen measurements at a normal level and at 2.5 ATA of hyperbaric pure oxygen is a reliable test to predict the final outcome in posttraumatic limb ischemia.

**CRUSH INJURIES AND SUTURING OF SEVERED LIMBS**

One RCT of crush injuries and suturing of severed limbs was found.\(^46\) Hyperbaric oxygen treatments were typically given at 2.5 ATA for 90 minutes, twice daily for 6 days, in a multiplace chamber. The study concluded that
<table>
<thead>
<tr>
<th>Source</th>
<th>No. of Subjects</th>
<th>Study Design</th>
<th>Chronic Nonhealing Wounds (Diabetic Ulcers)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faglia et al65</td>
<td>70</td>
<td>RCT</td>
<td>Major amputations: HBO, 3 (6.6%) of 35; control, 11 (33.3%) of 33; RR (95% CI), 0.26 (0.08-0.84)</td>
</tr>
<tr>
<td>Doctor et al66</td>
<td>30</td>
<td>RCT</td>
<td>Above ankle amputations: HBO, 2 (13%) of 15; control, 7 (47%) of 15; RR, 0.27; P&lt;.05</td>
</tr>
<tr>
<td>Faglia et al67</td>
<td>115</td>
<td>NRS</td>
<td>Major amputations: HBO, 7 (14%) of 51; control, 20 (31%) of 64; P = .01</td>
</tr>
<tr>
<td>Zamboni et al68</td>
<td>10</td>
<td>NRS</td>
<td>Complete healing: HBO, 4 (80%) of 5; control, 1 (20%) of 5; P&lt;.05</td>
</tr>
<tr>
<td>Baroni et al69</td>
<td>28</td>
<td>NRS</td>
<td>Healing: HBO, 16 (89%) of 18; control, 1 (10%) of 10; RR = .01</td>
</tr>
<tr>
<td>Oriani et al70</td>
<td>80</td>
<td>NRS</td>
<td>“Recovery”: HBO, 59 (95%) of 62; control, 12 (67%) of 18</td>
</tr>
<tr>
<td>Wattel et al71</td>
<td>20</td>
<td>CS</td>
<td>Complete healing: 15 (75%) of 20</td>
</tr>
<tr>
<td>Wattel et al72</td>
<td>59</td>
<td>CS</td>
<td>Complete healing: 52 (88%) of 59</td>
</tr>
<tr>
<td>Hammarlund et al73</td>
<td>17</td>
<td>NRS</td>
<td>Mean wound surface area decreased at 6-week end point; HBO, mean ± SD, 35.7% ± 17%; control, mean ± SD, 2.7% ± 11%; P&lt;.001</td>
</tr>
<tr>
<td>Mathieu et al45</td>
<td>23</td>
<td>CS</td>
<td>Recovery and complete healing (no detailed data, only reported that PtcO2 measurements in HBO predicts patients who will undergo amputation</td>
</tr>
<tr>
<td>Bouachou et al46</td>
<td>36</td>
<td>RCT</td>
<td>Complete healing: HBO, 17 (94%) of 18; control, 10 (55%) of 18; RR, 1.7; P&lt;.01</td>
</tr>
<tr>
<td>Marx et al47</td>
<td>160</td>
<td>RCT</td>
<td>Wound infection: HBO, 5 (6%) of 80; control, 19 (24%) of 80; RR, 0.25</td>
</tr>
<tr>
<td>Perrins et al48</td>
<td>48</td>
<td>RCT</td>
<td>Improved survival of skin grafts: HBO, 64%; control, 17%; RR, 3.8; P&lt;.001</td>
</tr>
<tr>
<td>Marx et al49</td>
<td>74</td>
<td>RCT</td>
<td>Rate of osteoradionecrosis: HBO, 5.4%; control, 30%; RR, 0.18; P = .01</td>
</tr>
<tr>
<td>Tobey et al50</td>
<td>12</td>
<td>RCT</td>
<td>“Significant improvement for healing progress in HBO group according to x-ray interpretation, clinical signs and symptoms.” This is a preliminary report, full analysis of the study apparently was never published</td>
</tr>
<tr>
<td>McKenzie et al51</td>
<td>26</td>
<td>CS</td>
<td>Improvement: 21 (81%) of 26 (13 [50%] of 26 met strict criteria for resolution of disease)</td>
</tr>
<tr>
<td>Gibson et al12</td>
<td>46</td>
<td>NRS</td>
<td>Mortality: HBO, 9 (31%) of 29; control, 7 (58%) of 12; P&lt;.05</td>
</tr>
<tr>
<td>Hitchcock et al13</td>
<td>33</td>
<td>NRS</td>
<td>Mortality: HBO, 7 (37%) of 19; control, 7 (50%) of 14</td>
</tr>
<tr>
<td>Schweigel et al14</td>
<td>43</td>
<td>NRS</td>
<td>Mortality: (No quantitative results reported.) “Feaver deaths reported among patients treated with HBO compared to those with HBO compared to those not treated with HBO”</td>
</tr>
<tr>
<td>Jackson et al15</td>
<td>24</td>
<td>NRS</td>
<td>Mortality: HBO, 4 (27%) of 15; control, 5 (56%) of 9</td>
</tr>
<tr>
<td>Rudge et al16</td>
<td>77</td>
<td>CS</td>
<td>Survival correlated well with site of infection (P = .004) and time to HBO (P = .08); a total of 23% of cases with limb involvement required an amputation after the start of HBO (16% had a primary amputation after starting HBO, and 7% had an amputation prior to HBO but required a revision one or more joints higher after starting HBO)</td>
</tr>
<tr>
<td>Trivedi et al17</td>
<td>15</td>
<td>CS</td>
<td>Infection controlled (100%) within 18 hours as judged by smear and culture methods</td>
</tr>
<tr>
<td>Hirn et al18</td>
<td>32</td>
<td>CS</td>
<td>Mortality: 9 (28%) of 32</td>
</tr>
<tr>
<td>Unsworth et al19</td>
<td>73</td>
<td>CS</td>
<td>Mortality: 15 (22%) of 73</td>
</tr>
<tr>
<td>Hart et al20</td>
<td>139</td>
<td>CS</td>
<td>Mortality: 27 (19%) of 139; amputations: 24 (17%) of 139</td>
</tr>
<tr>
<td>Guidi et al21</td>
<td>21</td>
<td>CS</td>
<td>Mortality: 4 (19%) of 21; amputations: 7 (33%) of 21</td>
</tr>
<tr>
<td>Tonjum et al22</td>
<td>30</td>
<td>CS</td>
<td>Mortality: 9 (30%) of 30; amputations: 6 (20%) of 30</td>
</tr>
<tr>
<td>Skiles et al23</td>
<td>33</td>
<td>CS</td>
<td>Mortality: 17 (52%) of 33</td>
</tr>
<tr>
<td>Fowler et al24</td>
<td>9</td>
<td>CS</td>
<td>Mortality: 1 (11%) of 9; amputations: 3 (60%) of 5, lower extremities cases</td>
</tr>
<tr>
<td>Darke et al25</td>
<td>88</td>
<td>CS</td>
<td>Mortality: 28 (32%) of 88</td>
</tr>
<tr>
<td>Holland et al26</td>
<td>49</td>
<td>CS</td>
<td>Mortality: 13 (27%) of 49</td>
</tr>
<tr>
<td>Hart et al27</td>
<td>44</td>
<td>CS</td>
<td>Mortality: 10 (23%) of 44</td>
</tr>
<tr>
<td>Roding et al28</td>
<td>130</td>
<td>CS</td>
<td>Mortality: 29 (22%) of 130</td>
</tr>
</tbody>
</table>

(continued)
HBO improved complete healing rates and reduced wound infection and wound dehiscence in crush injury.

**COMPROMISED SKIN GRAFTS**

Two RCTs were found on compromised skin grafts.\(^47,48\) Hyperbaric oxygen treatments were typically given either for a total of 20 sessions or twice daily for 3 days. The authors concluded that HBO improved the survival of skin grafts, wound infection, and compete wound healing.

**OSTEORADIONECROSIS**

Two RCTs and 1 case series on osteoradionecrosis were found.\(^49-51\) Hyperbaric oxygen treatments were typically given at 2 to 2.5 ATA for a total of 20 sessions. Clinical signs and symptoms and radiographic examinations were performed to evaluate each patient's progress in the 2 trials. Persistent mucosal and cutaneous coverage of the

<table>
<thead>
<tr>
<th>Study Design and No. of Studies</th>
<th>Study Design and No. of Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indications</td>
<td>RCT</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----</td>
</tr>
<tr>
<td>Chronic nonhealing wound (diabetes and nondiabetes)</td>
<td>2+</td>
</tr>
<tr>
<td>Acute traumatic peripheral ischemia</td>
<td>...</td>
</tr>
<tr>
<td>Crush injuries</td>
<td>1+</td>
</tr>
<tr>
<td>Acute peripheral arterial insufficiency</td>
<td>...</td>
</tr>
<tr>
<td>Skin grafts</td>
<td>2+</td>
</tr>
<tr>
<td>Osteoradionecrosis</td>
<td>2+</td>
</tr>
<tr>
<td>Soft tissue radionecrosis</td>
<td>...</td>
</tr>
<tr>
<td>Gas gangrene</td>
<td>...</td>
</tr>
<tr>
<td>Necrotizing infections</td>
<td>...</td>
</tr>
<tr>
<td>Chronic osteomyelitis</td>
<td>...</td>
</tr>
</tbody>
</table>

Abbreviations: CS, case series; NRS, nonrandomized comparison study; ND, not determinable; RCT, randomized controlled trial; NS, not significant; RCT, randomized controlled trial; RR, risk ratio.
wound was used as the outcome in the case series. The authors concluded that HBO treatment reduced the rate of osteoradionecrosis. Detailed information about the patients’ characteristics, such as age, sex, and wound duration, or clearly defined diagnostic criteria of the underlying conditions, were not given in reports of studies of compromised skin grafts and osteoradionecrosis.

SOFT TISSUE RADIONECROSIS

We found 13 case series on soft tissue radionecrosis. All of these studies reported a beneficial effect of the HBO treatment regimen for this condition. One study compared the patients with historical controls; in this study, a greater number of patients in the HBO group healed without surgical intervention, but the authors did not calculate whether this difference was statistically significant. In several of the studies, patients had failed to heal from standard treatments received before the trial of HBO.

CHRONIC NONHEALING WOUNDS (DIABETIC AND NONDIABETIC ULCERS)

Two RCTs, 4 nonrandomized studies, and 2 case series that evaluated the use of HBO on diabetic wounds were identified. Hyperbaric oxygen was generally given at 2 to 2.8 ATA, 5 days per week (a typical session lasted for 90-180 minutes). The authors of the studies concluded that HBO is beneficial in the management of diabetic wounds. They found that the use of HBO significantly reduced wound size when compared with standard wound care alone and that the use of HBO was associated with a higher rate of complete healing as well as a decrease in major amputation rates in diabetic wounds.

Only one study included patients with nondiabetic wounds. Hyperbaric oxygen was generally given at 2.5-3.0 ATA, 5 days per week, for total of 30 treatments in a multiplace chamber (a typical session lasted for 90 minutes). The study found that the use of HBO significantly reduced the wound surface area. The wound size decreased at the 6-week end point when compared with the control group; the investigators concluded that the use of HBO is beneficial in the management of nondiabetic wounds.

Because the direct evidence base on nondiabetic wounds is limited to a single study of only 16 patients, more research is needed to assess the efficacy of HBO in these patients. The information on the clinical studies of diabetic and nondiabetic wounds is not sufficient to determine whether results in studies on diabetic wounds are generalizable to nondiabetic wounds.

HBO AS AN ADJUNCTIVE THERAPY TO STANDARD WOUND CARE

In all studies, HBO was used as adjunctive therapy in addition to the main treatment modalities of wound debridement and antibiotics. The studies that we reviewed on progressive necrotizing infections and chronic refractory osteomyelitis reported inconsistent results on whether HBO is a beneficial adjunctive therapy to standard wound care. We found only 1 case series on acute traumatic peripheral ischemia and 1 RCT on crush injuries and suturing of severed limbs. These studies found that HBO...
was beneficial, but no confirmation from a separate study was available.

From the studies that we evaluated, the evidence suggests that HBO aids in wound healing for compromised skin grafts, osteoradionecrosis, gas gangrene, soft tissue radionecrosis, and chronic nonhealing diabetic wounds. There is evidence from case series suggesting the beneficial effect of HBO for soft tissue radionecrosis. However, the overall study quality is poor, with inadequate or no controls in most studies. Therefore, the benefits found in the studies may be due to factors other than HBO treatment. Still, the wounds studied were severe. Some of the wounds were chronic and had not responded to other treatments. There may have been no alternative treatments, or the alternative might have been a drastic step, such as amputation. For these wound conditions, the studies consistently showed a benefit for HBO. The uncertainties in the results, possibly due to poor study design, must be weighed against the harms of alternative treatments.

AT WHAT POINT IN TREATMENT SHOULD HBO THERAPY BE INTRODUCED?

The literature provides no guidance on when HBO therapy should be initiated for chronic nonhealing wounds. Only 2 studies that evaluated the effect of HBO on chronic diabetic wounds reported the duration of the wounds prior to treatment, which ranged from at least 6 to 12 months. For acute wounds such as necrotizing fasciitis, HBO treatments generally were reported to begin immediately on hospitalization or after the initial wound debridement. In the case series reports on soft tissue radionecrosis, many studies began HBO treatment after failure of a course of standard therapy; however, 1 study reported that earlier treatment with HBO led to earlier resolution of cystitis.

CLASSIFICATION OF WOUNDS BASED ON LEVEL OF HYPOXIA RATHER THAN DIAGNOSIS

There is insufficient evidence based on the studies we examined to use measured tissue hypoxia as a criterion to determine whether adjunctive HBO treatments might be efficacious in reducing mortality and morbidity. None of the studies evaluated in this report used tissue hypoxia measurement as a patient inclusion criterion. Only 2 RCTs, 46,65 2 nonrandomized comparison studies, 67,68 and 4 case series55,73,74,76 reported levels of transcutaneous tissue oxygen. Mean (SD) transcutaneous tissue oxygen levels on admission in these studies were: 12 mm Hg in the HBO group and 35 mm Hg in the control group, 68 28 (13.4) mm Hg, 67 22 (10.6) mm Hg, 67 and about 15 to 19 mm Hg. 67 The distal transcutaneous oxygen tension at 2.5 ATA pure oxygen was considered a reliable test to predict the final outcome of wound healing. However, these measurements represent averages of the study populations and were not correlated with outcomes of individual patients. Therefore, this information is not useful to guide treatments for individual patients. The large difference in tissue oxygen levels between the HBO group and the control group in the study by Zamboni et al 75 also suggests that the patient selection bias in this nonrandomized study has made interpretation of the outcomes difficult.

CRITERIA DETERMINING WHO WILL BENEFIT FROM HBO THERAPY

Several studies measured whether patients’ tissue oxygen level during HBO was predictive of response. One study 71 of 20 patients with chronic arterial insufficiency ulcers (n=11) and diabetic ulcers (n=9) reported that wound healing was achieved in all patients who were able to achieve a distal transcutaneous tissue oxygen level of at least 100 mm Hg during HBO therapy. Complete healing occurred in 15 of the 20 patients. Similar findings were reported in a study of 15 patients 73 undergoing musculocutaneous flap transplantation and a case series 73 of 23 patients with posttraumatic limb ischemia. Both found that PtO2 measurements in HBO predict patients who will undergo amputation. None of the studies stratified results by any other potential predictors of response.

CONTRAINDICATIONS TO MONOPLACE VS MULTIPLACE CHAMBERS

We found no studies that addressed the issues of efficacy or safety differences between monoplace and multiplace chambers. Examination of the adverse events reported by all of the studies revealed that oxygen toxicity in the form of seizures was observed in up to about 10% of the patients in several studies. One seizure-related death occurred in a “severely toxemic” patient who died 2 hours after an uncontrolled seizure. A patient with pneumothorax was one among several deaths reported in a case series of 30 patients. The pneumothorax was not reported to be the immediate cause of death in this patient. The need to provide emergency care during HBO treatment suggests that multiplace chambers may provide a safer treatment modality although this has not been demonstrated.

MOST RELIABLE AND STANDARDIZABLE METHOD OF MEASURING TISSUE OXYGEN

This issue cannot be resolved based on the studies reviewed in this report. Only 2 RCTs 46,65 and 2 nonrandomized comparison studies 67,68 reported transcutaneous measurements of tissue oxygen levels. Three studies evaluated 195 patients with diabetic leg ulcers. The fourth study, 46 involving 36 patients with acute limb injuries, reported that it used the miniature Clarke electrode as the method of transcutaneous measurement. Zamboni et al 76 used an instrument (TCM3/TINA) from Radiometer America Inc (Westlake, Ohio) and took measurements in noninflamed skin 1 cm medially, away from the wound edge at the midpoint of the ulcer. The other 2 reports did not provide specific information about the method of tissue oxygen measurement.

ADVERSE EVENTS

Nine studies of the conditions listed in the “Results” section reported adverse events with the use of HBO therapy.
One case of transient minor blurring of vision occurred with the treatment of osteoradionecrosis.11 Two patients reported transient vision changes, and 3 patients required tympanostomy tubes in chronic refractory osteomyelitis.11 The only adverse event reported was a case of barotraumatic otitis due to HBO therapy in diabetic ulcers, and there was no reporting of adverse effects in non-diabetic ulcers.65 Most of the adverse events were reported in articles on gas gangrene. Six case series17,18,20,22,23,25 reported adverse events attributed to HBO, and in 5 studies, a total of 23 of 322 patients with seizures attributed to oxygen toxicity were reported.18,20,22,23,25 One death occurred in a study of 88 patients.23 This patient had an uncontrolled seizure and died 2 hours after decompression. This patient was also reported to be severely toxemic; the infection was due to an anaerobic streptococcus. One pneumothorax was reported in one study of 30 patients.22 Another case of “oxygen toxicity” was reported in the same study22 but the details were not reported. This patient died with pulmonary embolism, pneumonia, and peritonitis. Other adverse effects included earaches and barotraumatic otitis. In addition to these 9 studies, 1 article22 reported 3 cases of pulmonary edema (1 death) in patients who underwent HBO therapy for chronic wounds.

LIMITATIONS

The purpose of this report was to evaluate the evidence of the benefits and risks of HBO as adjunctive therapy to standard wound care. There are studies of the use of HBO for other indications; some of these studies probably reported adverse events. A full search and analysis of studies reporting adverse events associated with the use of HBO for indications other than wound care was outside the scope of this assessment. Adverse events in these studies may or may not be applicable to the wound care patient population, depending on factors such as comorbid conditions.

CONCLUSIONS

The overall methodologic quality of the studies that we found in this systemic review is poor, consisting mostly of small case series or nonrandomized comparisons. However, the consistency of the results of these studies suggests that HBO may aid in wound healing for compromised skin grafts, osteoradionecrosis, soft tissue radionecrosis, gas gangrene, progressive necrotizing infection, and chronic nonhealing diabetic wounds. The studies found conflicting results regarding the survival rates in patients with necrotizing fasciitis. Serious adverse events, such as seizures and barotraumatic otitis, were reported in 9 studies. High-quality RCTs that evaluate the short- and long-term risks and benefits of HBO therapy are necessary to better inform clinical decisions about the use of HBO to improve recovery.

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REFERENCES


25. Darke SG, King AM, Slack WK. Gas gangrene and related infection: classification, clinical features and aetiology, management and mortality: a report of 88