2017 Repair dental restorations

Contents

Data extracted was tabulated in a google sheet. Then exported as csv file and imported in R (R Core Team (2017). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.)

Data cleaning and organization was done with package tidyverse (Hadley Wickham (2017). tidyverse: Easily Install and Load the 'Tidyverse'. R package version 1.2.1. https://CRAN.R-project.org/package=tidyverse).

The package meta (Guido Schwarzer (2007), meta: An R package for meta-analysis, R News, 7(3), 40-45.) was used for the meta-analysis. A funnel plot was used to detect publication bias. The heterogenicity between studies was checked with I2 and visualized with a Baujat plot (Baujat B, Mahé C, Pignon JP, Hill C (2002), A graphical method for exploring heterogeneity in meta-analyses: Application to a meta-analysis of 65 trials. Statistics in Medicine, 30, 2641–2652.). We grouped the studies with same intervention and control and considered any adverse outcome. A random effect meta-analysis using odds-ratio as outcome was performed with a Mantel-Haenzel method. A forest plot was used to visualize the overall effect of the interventions, with a 95% confidence interval.

Paquetes

Dataset

```
df <- read_csv("https://docs.google.com/spreadsheets/d/e/2PACX-1vRSKuBlcQTVJK2fZyZ4Nvf4SwSqVrxcfAGhNhl6
```

```
## Parsed with column specification:
## cols(
##   Comparison = col_character(),
##   Material = col_character(),
##   firstAuthor = col_character(),
##   year = col_character(),
##   paper = col_character(),
##   quality = col_character(),
##   intervention_a = col_character(),
##   intervention_b = col_character(),
##   EvA = col_character(),
##   TotalA = col_character(),
##   EvB = col_character(),
##   TotalB = col_character(),
##   Outcome = col_character(),
##   Comments = col_character()
## )
```

Data cleaning

```
glimpse(df)
```

```
## Observations: 55
## Variables: 14
## $ Comparison     <chr> "Sealants vs no-treatment Kz", "Sealants vs rep...
## $ Material       <chr> "Composite", NA, NA, "Composite", NA, NA, "Comp...
## $ firstAuthor    <chr> "Gordan", "Gordan", NA, "Gordan", "Gordan", NA,...
## $ year           <chr> "2009", "2011", NA, "2009", "2011", NA, "2009",...
## $ paper          <chr> "a", NA, NA, "b", NA, NA, "f", "g", NA, "b", "b...
## $ quality        <chr> NA, NA, NA, NA, NA, NA, NA, NA, "--------------...
## $ intervention_a <chr> "Sealant", "Sealant", NA, "Sealant", "Sealant",...
## $ intervention_b <chr> "No-treatment", "Replacement", NA, "No-treatmen...
## $ EvA            <chr> "2", NA, NA, "0", NA, NA, "7", "1", "----------...
## $ TotalA         <chr> "7", NA, NA, "7", NA, NA, "11", "11", "--------...
## $ EvB            <chr> "5", NA, NA, "1", NA, NA, "5", "1", "----------...
```

```
## $ TotalB         <chr> "13", NA, NA, "13", NA, NA, "13", "13", "------...
## $ Outcome        <chr> "MA", NA, NA, "SC", NA, NA, "MA", "SC", "------...
## $ Comments       <chr> NA, "SC-secondary caries", "PS-postoperative se...
```

Clean dataset from empty rows, strange symbols, etc

```
df <- df %>% filter(str_detect(df$Comparison, "vs"),
                      trimws(EvA) != "",
                    !str_detect(EvA, "\\?"),
                    !str_detect(EvA, "%") )
```

```
## Warning: package 'bindrcpp' was built under R version 3.4.2
```

```
df$firstAuthor <- str_trim(df$firstAuthor, "right")
```

Select only relevant columns

```
df <- df %>% select(Comparison:Outcome) %>%
  select(-quality)
```

create a new column id

```
df <-  mutate(df, id = paste(firstAuthor, ", ", year, paper))
```

Dataset clean

Converting factors to numeric variables

```
glimpse(df)
```

```
## Observations: 33
## Variables: 13
## $ Comparison     <chr> "Sealants vs no-treatment Kz", "Sealants vs no-...
## $ Material       <chr> "Composite", "Composite", "Composite", "Composi...
## $ firstAuthor    <chr> "Gordan", "Gordan", "Gordan", "Gordan", "Gordan...
## $ year           <chr> "2009", "2009", "2009", "2009", "2011", "2011",...
## $ paper          <chr> "a", "b", "f", "g", "b", "b", "b", "d", "e", "f...
## $ intervention_a <chr> "Sealant", "Sealant", "Refinishing", "Refinishi...
## $ intervention_b <chr> "No-treatment", "No-treatment", "No-treatment",...
## $ EvA            <chr> "2", "0", "7", "1", "1", "1", "1", "0", "0", "1...
## $ TotalA         <chr> "7", "7", "11", "11", "14", "14", "14", "14", "...
## $ EvB            <chr> "5", "1", "5", "1", "7", "7", "7", "7", "1", "1...
## $ TotalB         <chr> "13", "13", "13", "13", "19", "19", "19", "14",...
## $ Outcome        <chr> "MA", "SC", "MA", "SC", "MA", "SC", "TS", "MA",...
## $ id             <chr> "Gordan ,  2009 a", "Gordan ,  2009 b", "Gordan...
```

```
df$EvA <- as.integer(df$EvA)
df$TotalA <- as.integer(df$TotalA)
df$EvB <- as.integer(df$EvB)
df$TotalB <- as.integer(df$TotalB)

df <- df %>%
  mutate(groups = paste(Comparison, Outcome))
```

```
summary(df)
```

```
##   Comparison          Material         firstAuthor
##  Length:33          Length:33          Length:33
```

```
##  Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character
##
##
##
##      year              paper           intervention_a
##  Length:33          Length:33          Length:33
##  Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character
##
##
##
##  intervention_b          EvA              TotalA          EvB
##  Length:33          Min.   : 0.000   Min.   : 7.0   Min.   : 0.00
##  Class :character   1st Qu.: 1.000   1st Qu.:14.0   1st Qu.: 1.00
##  Mode  :character   Median : 2.000   Median :15.0   Median : 2.00
##                     Mean   : 4.455   Mean   :20.7   Mean   : 5.03
##                     3rd Qu.: 7.000   3rd Qu.:20.0   3rd Qu.: 7.00
##                     Max.   :45.000   Max.   :66.0   Max.   :35.00
##      TotalB        Outcome              id               groups
##  Min.   :13.00   Length:33          Length:33          Length:33
##  1st Qu.:14.00   Class :character   Class :character   Class :character
##  Median :19.00   Mode  :character   Mode  :character   Mode  :character
##  Mean   :21.94
##  3rd Qu.:22.00
##  Max.   :58.00
```

Create groups for comparisons

Any intervention (Sealant, Refinishing or Repair) vs grouped comparison and grouped outcome

```
df <- mutate(df, groups = paste( intervention_b, Outcome))
table(df$groups)
```

```
##
## No-treatment all parameters             No-treatment MA
##                             1                           6
##             No-treatment SC             No-treatment SR
##                             6                           1
##             No-treatment TS  Replacement all parameters
##                             3                           1
##              Replacement MA              Replacement SC
##                             5                           5
##              Replacement TS
##                             5
```

1. No-treatment MA (6)

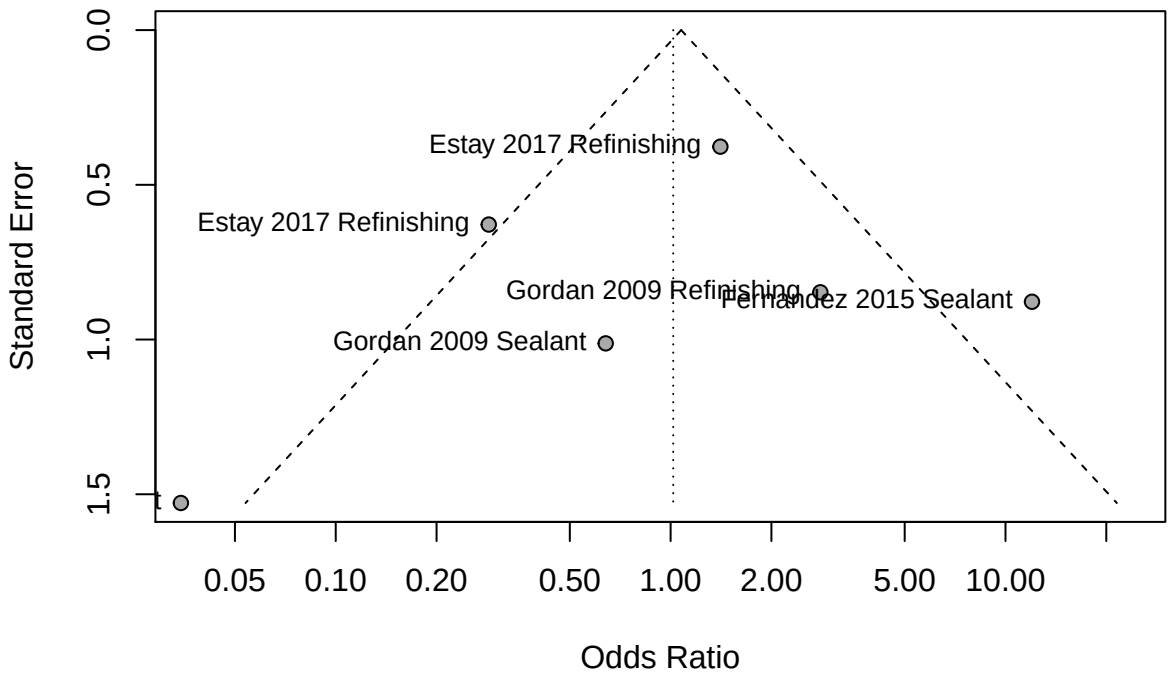
Data selection

```
data_meta <- df %>%
  filter(groups == "No-treatment MA")
```

```
meta1 <- metabin(EvA, TotalA,
                 EvB, TotalB,
                 data = data_meta,
                 sm="OR",  method.tau = "DL",
                 comb.fixed = FALSE,
                 studlab = paste(firstAuthor, year, intervention_a))
```

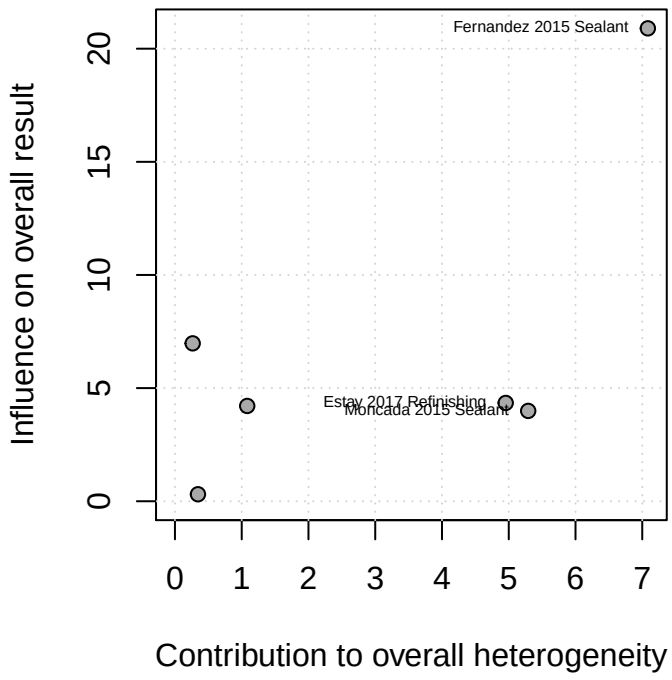
Bias

```
funnel.meta(meta1,
            studlab = TRUE)
```



Heterogeneity

```
baujat.meta(meta1,
            yscale = 10, xmin = 3, ymin = 10,
            cex.studlab = .50)
```



Meta-analysis and forest plot

```
summary(meta1)
```

```
## Number of studies combined: k = 6
##
##                          OR           95%-CI    z  p-value
## Random effects model 1.0181 [0.3054; 3.3946] 0.03   0.9767
##
## Quantifying heterogeneity:
##  tau^2 = 1.5285; H = 1.95 [1.29; 2.95]; I^2 = 73.8% [40.2%; 88.5%]
##
## Test of heterogeneity:
##      Q d.f.  p-value
##  19.10    5   0.0018
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
## - Continuity correction of 0.5 in studies with zero cell frequencies
```

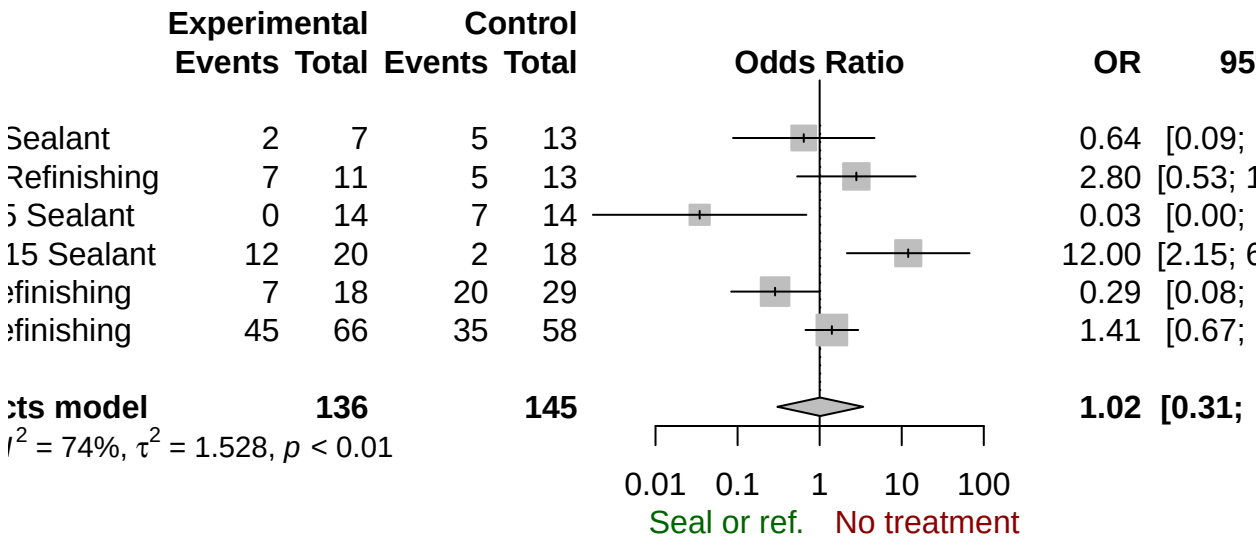
```
meta1
```

```
##                             OR            95%-CI %W(random)
## Gordan 2009 Sealant      0.6400 [0.0880;  4.6554]       14.8
## Gordan 2009 Refinishing  2.8000 [0.5321; 14.7350]       16.8
```

```
## Moncada 2015 Sealant     0.0345 [0.0017;  0.6894]        9.8
## Estay 2017 Refinishing   0.2864 [0.0836;  0.9813]       19.6
## Fernandez 2015 Sealant  12.0000 [2.1471; 67.0674]       16.4
## Estay 2017 Refinishing   1.4082 [0.6730;  2.9464]       22.6
##
## Number of studies combined: k = 6
##
##                          OR           95%-CI    z  p-value
## Random effects model 1.0181 [0.3054; 3.3946] 0.03   0.9767
##
## Quantifying heterogeneity:
##  tau^2 = 1.5285; H = 1.95 [1.29; 2.95]; I^2 = 73.8% [40.2%; 88.5%]
##
## Test of heterogeneity:
##      Q d.f.  p-value
##  19.10    5   0.0018
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
## - Continuity correction of 0.5 in studies with zero cell frequencies
```

```
forest.meta(meta1,
       comb.fixed = FALSE,
       sortvar = year,
       # LEFT
       label.left         = "Seal or ref.",
       col.label.left     = "darkgreen",
       # RIGHT
       label.right        = "No treatment",
       col.label.right    = "darkred")
```

```
## Warning: Unknown or uninitialised column: '.subset'.
```



---

2. No-treatment SC (6)

Data selection

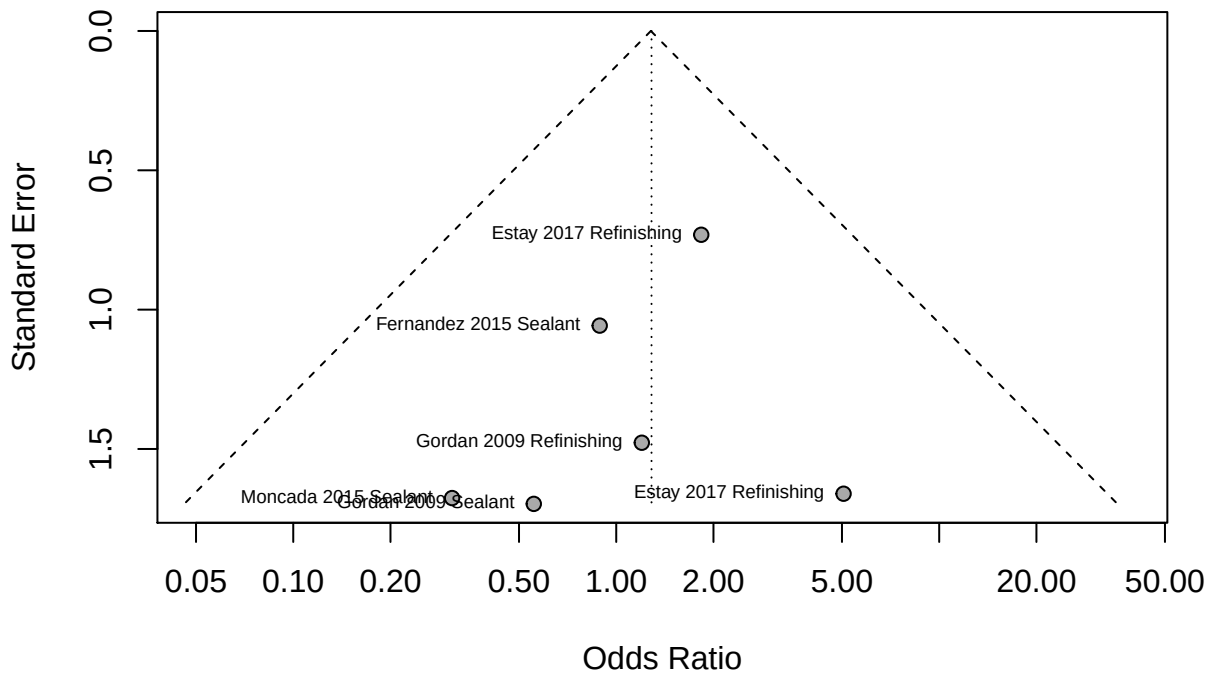
```
data_meta <- df %>%
  filter(groups == "No-treatment SC")
data_meta
```

```
## # A tibble: 6 x 14
##                       Comparison  Material firstAuthor  year paper
##                            <chr>     <chr>       <chr> <chr> <chr>
## 1    Sealants vs no-treatment Kz Composite      Gordan  2009     b
## 2 Refinishing vs no-treatment Kz Composite      Gordan  2009     g
## 3    Sealants vs no-treatment Ag   Amalgam     Moncada  2015     e
## 4 Refinishing vs no-treatment Kz Composite       Estay  2017     k
## 5    Sealants vs no-treatment Kz Composite   Fernandez  2015     b
## 6 Refinishing vs no-treatment Ag   Amalgam       Estay  2017     h
## # ... with 9 more variables: intervention_a <chr>, intervention_b <chr>,
## #   EvA <int>, TotalA <int>, EvB <int>, TotalB <int>, Outcome <chr>,
## #   id <chr>, groups <chr>
```

```r
meta1 <- metabin(EvA, TotalA,
                 EvB, TotalB,
                 data = data_meta,
                 sm="OR",  method.tau = "DL",
                 comb.fixed = FALSE,
                 studlab = paste(firstAuthor, year, intervention_a))
```

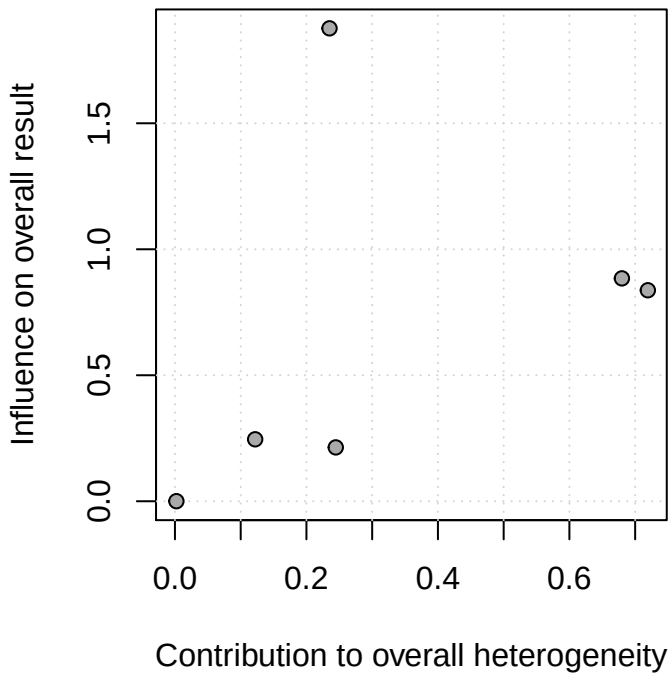
Bias

```r
funnel.meta(meta1,
            studlab = TRUE,
            cex.studlab = .55)
```



Heterogeneity

```r
baujat.meta(meta1,
            yscale = 10, xmin = 3, ymin = 10,
            cex.studlab = .50)
```



Meta-analysis and forest plot

```
summary(meta1)
```

```
## Number of studies combined: k = 6
##
##                         OR           95%-CI    z  p-value
## Random effects model 1.286 [0.4991; 3.3137] 0.52   0.6024
##
## Quantifying heterogeneity:
##  tau^2 = 0; H = 1.00 [1.00; 1.26]; I^2 = 0.0% [0.0%; 36.7%]
##
## Test of heterogeneity:
##     Q d.f.  p-value
##  2.00    5   0.8487
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
## - Continuity correction of 0.5 in studies with zero cell frequencies
```

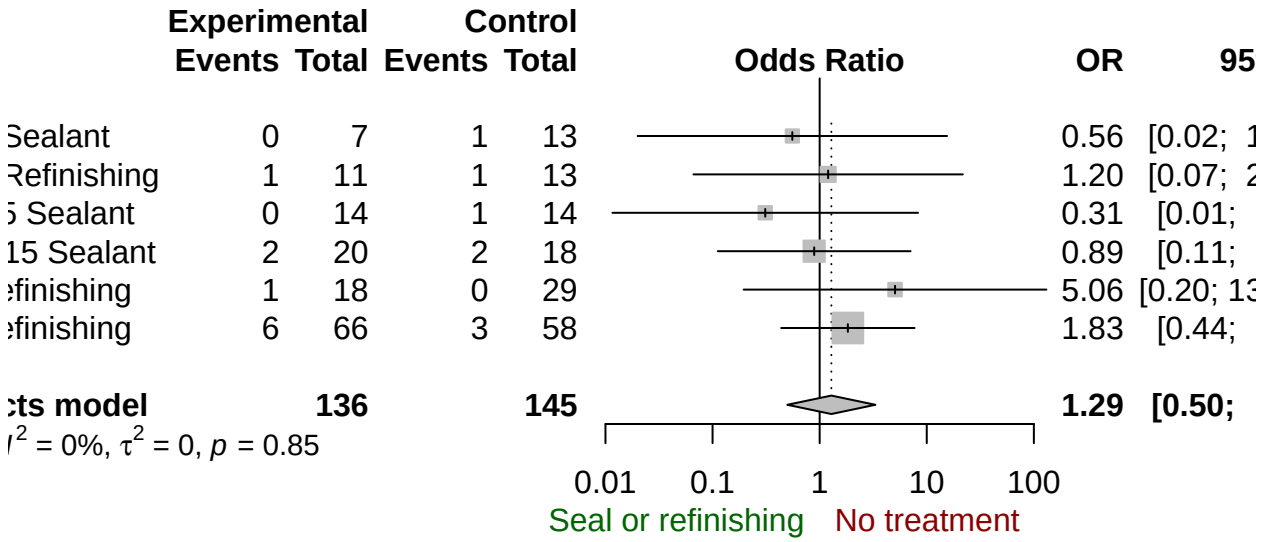
```
meta1
```

```
##                             OR             95%-CI %W(random)
## Gordan 2009 Sealant     0.5556 [0.0200;  15.4620]        8.1
## Gordan 2009 Refinishing 1.2000 [0.0663;  21.7233]       10.7
```

```
## Moncada 2015 Sealant    0.3103 [0.0116;   8.2917]        8.3
## Estay 2017 Refinishing  5.0571 [0.1952; 131.0509]        8.5
## Fernandez 2015 Sealant  0.8889 [0.1119;   7.0614]       20.9
## Estay 2017 Refinishing  1.8333 [0.4372;   7.6869]       43.6
##
## Number of studies combined: k = 6
##
##                          OR           95%-CI    z  p-value
## Random effects model 1.286 [0.4991; 3.3137] 0.52   0.6024
##
## Quantifying heterogeneity:
##  tau^2 = 0; H = 1.00 [1.00; 1.26]; I^2 = 0.0% [0.0%; 36.7%]
##
## Test of heterogeneity:
##     Q d.f.  p-value
##  2.00    5   0.8487
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
## - Continuity correction of 0.5 in studies with zero cell frequencies
```

```r
forest.meta(meta1,
       comb.fixed = FALSE,
       sortvar = year,
       # LEFT
       label.left         = "Seal or refinishing",
       col.label.left     = "darkgreen",
       # RIGHT
       label.right        = "No treatment",
       col.label.right    = "darkred")
```

```
## Warning: Unknown or uninitialised column: '.subset'.
```



---

3. No-treatment TS (3)

Data selection

```
data_meta <- df %>%
  filter(groups == "No-treatment TS")
data_meta
```

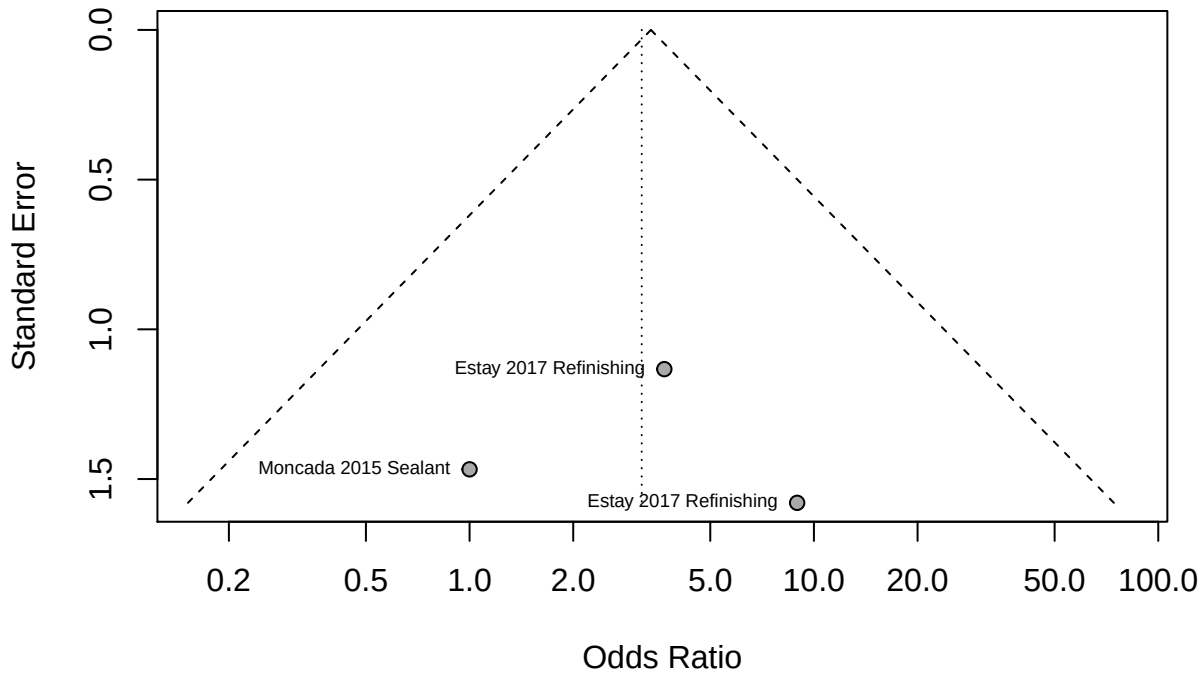
```
## # A tibble: 3 x 14
##                       Comparison  Material firstAuthor  year paper
##                            <chr>     <chr>       <chr> <chr> <chr>
## 1    Sealants vs no-treatment Ag   Amalgam     Moncada  2015     f
## 2 Refinishing vs no-treatment Kz Composite       Estay  2017     l
## 3 Refinishing vs no-treatment Ag   Amalgam       Estay  2017     i
## # ... with 9 more variables: intervention_a <chr>, intervention_b <chr>,
## #   EvA <int>, TotalA <int>, EvB <int>, TotalB <int>, Outcome <chr>,
## #   id <chr>, groups <chr>
```

```
meta1 <- metabin(EvA, TotalA,
                 EvB, TotalB,
                 data = data_meta,
                 sm="OR",  method.tau = "DL",
```

```
                comb.fixed = FALSE,
                studlab = paste(firstAuthor, year, intervention_a))
```

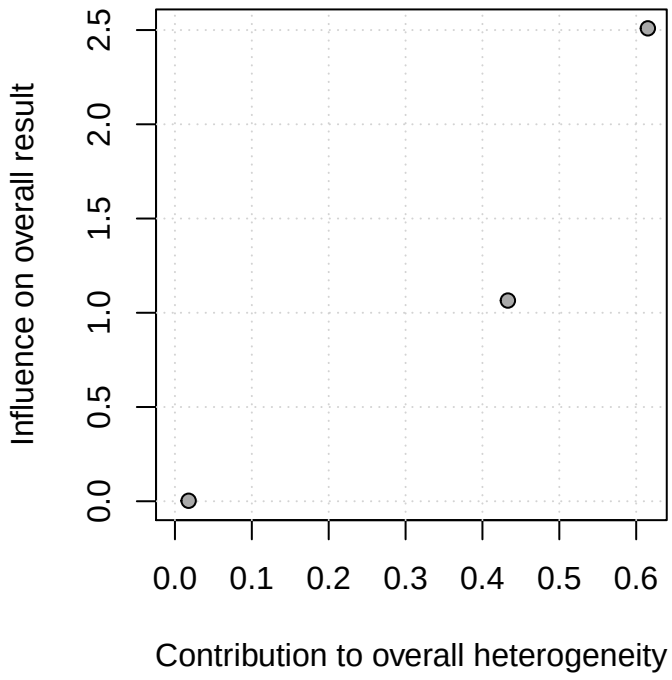
Bias

```
funnel.meta(meta1,
            studlab = TRUE,
            cex.studlab = .55)
```



Heterogeneity

```
baujat.meta(meta1,
            yscale = 10, xmin = 3, ymin = 10,
            cex.studlab = .50)
```



Meta-analysis and forest plot

```
summary(meta1)
```

```
## Number of studies combined: k = 3
##
##                          OR            95%-CI    z  p-value
## Random effects model 3.1616 [0.6856; 14.5791] 1.48   0.1400
##
## Quantifying heterogeneity:
##  tau^2 = 0; H = 1.00 [1.00; 2.27]; I^2 = 0.0% [0.0%; 80.6%]
##
## Test of heterogeneity:
##     Q d.f.  p-value
##  1.07    2   0.5850
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
## - Continuity correction of 0.5 in studies with zero cell frequencies
```

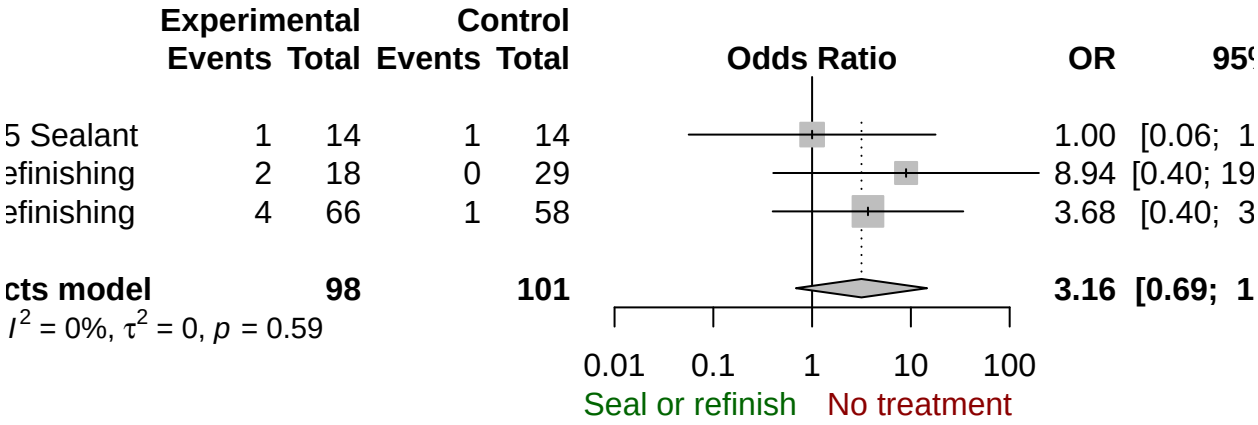
```
meta1
```

```
##                            OR             95%-CI %W(random)
## Moncada 2015 Sealant   1.0000 [0.0563;  17.7510]       28.2
## Estay 2017 Refinishing 8.9394 [0.4045; 197.5585]       24.4
```

```
## Estay 2017 Refinishing 3.6774 [0.3992;  33.8804]       47.4
##
## Number of studies combined: k = 3
##
##                           OR            95%-CI    z  p-value
## Random effects model 3.1616 [0.6856; 14.5791] 1.48   0.1400
##
## Quantifying heterogeneity:
##  tau^2 = 0; H = 1.00 [1.00; 2.27]; I^2 = 0.0% [0.0%; 80.6%]
##
## Test of heterogeneity:
##     Q d.f.  p-value
##  1.07    2   0.5850
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
## - Continuity correction of 0.5 in studies with zero cell frequencies
```

```
forest.meta(meta1,
       comb.fixed = FALSE,
       sortvar = year,
       # LEFT
       label.left         = "Seal or refinish",
       col.label.left     = "darkgreen",
       # RIGHT
       label.right        = "No treatment",
       col.label.right    = "darkred")
```

```
## Warning: Unknown or uninitialised column: '.subset'.
```



---

4. Replacement MA (5)

Data selection

```
data_meta <- df %>%
  filter(groups == "Replacement MA")
data_meta
```

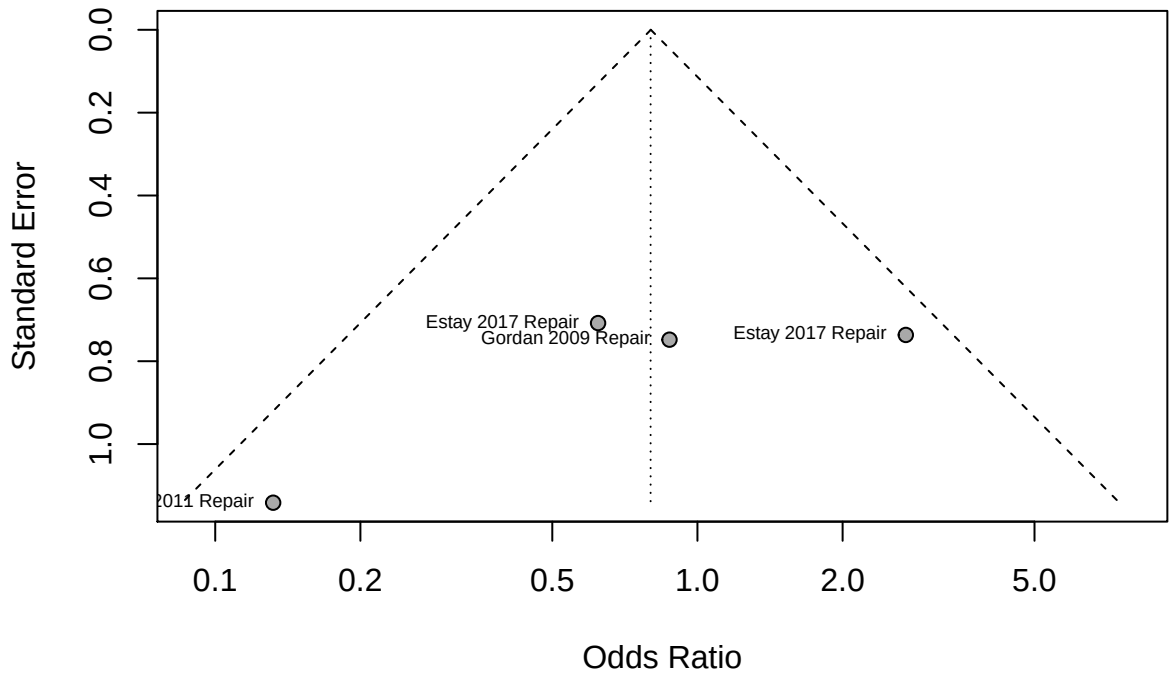
```
## # A tibble: 5 x 14
##                   Comparison  Material firstAuthor  year paper
##                        <chr>     <chr>       <chr> <chr> <chr>
## 1   Repair vs replacement Ag   Amalgam      Gordan  2011     b
## 2 Sealants vs replacement Ag   Amalgam     Moncada  2015     a
## 3   Repair vs replacement Kz Composite       Estay  2017     d
## 4   Repair vs replacement Ag   Amalgam       Estay  2017     a
## 5   Repair vs replacement Kz Composite      Gordan  2009     c
## # ... with 9 more variables: intervention_a <chr>, intervention_b <chr>,
## #   EvA <int>, TotalA <int>, EvB <int>, TotalB <int>, Outcome <chr>,
## #   id <chr>, groups <chr>
```

```
meta1 <- metabin(EvA, TotalA,
                 EvB, TotalB,
                 data = data_meta,
```

```
                sm="OR",  method.tau = "DL",
                comb.fixed = FALSE,
                studlab = paste(firstAuthor, year, intervention_a))
```

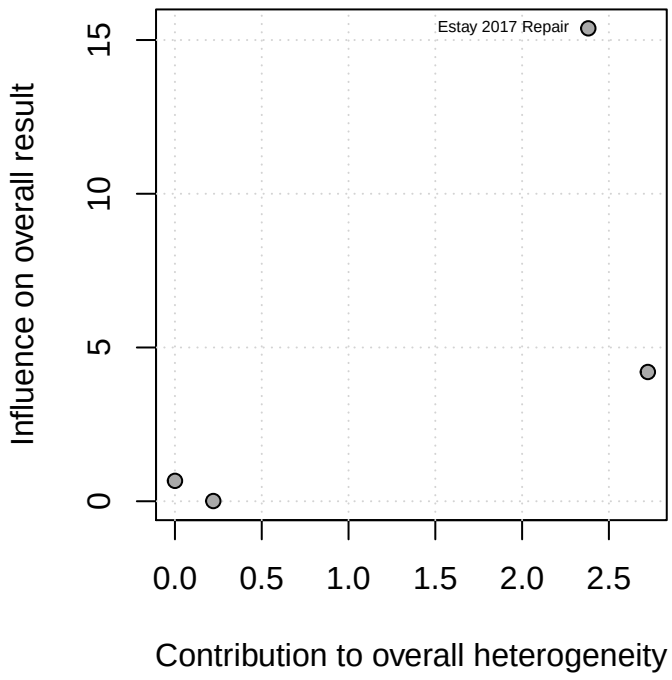
Bias

```
funnel.meta(meta1,
            studlab = TRUE,
            cex.studlab = .55)
```



Heterogeneity

```
baujat.meta(meta1,
            yscale = 10, xmin = 3, ymin = 10,
            cex.studlab = .50)
```



Meta-analysis and forest plot

```
summary(meta1)
```

```
## Number of studies combined: k = 4
##
##                          OR           95%-CI     z  p-value
## Random effects model 0.7996 [0.2774; 2.3052] -0.41   0.6789
##
## Quantifying heterogeneity:
##  tau^2 = 0.5096; H = 1.34 [1.00; 2.31]; I^2 = 44.1% [0.0%; 81.3%]
##
## Test of heterogeneity:
##     Q d.f.  p-value
##  5.37    3   0.1467
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
```

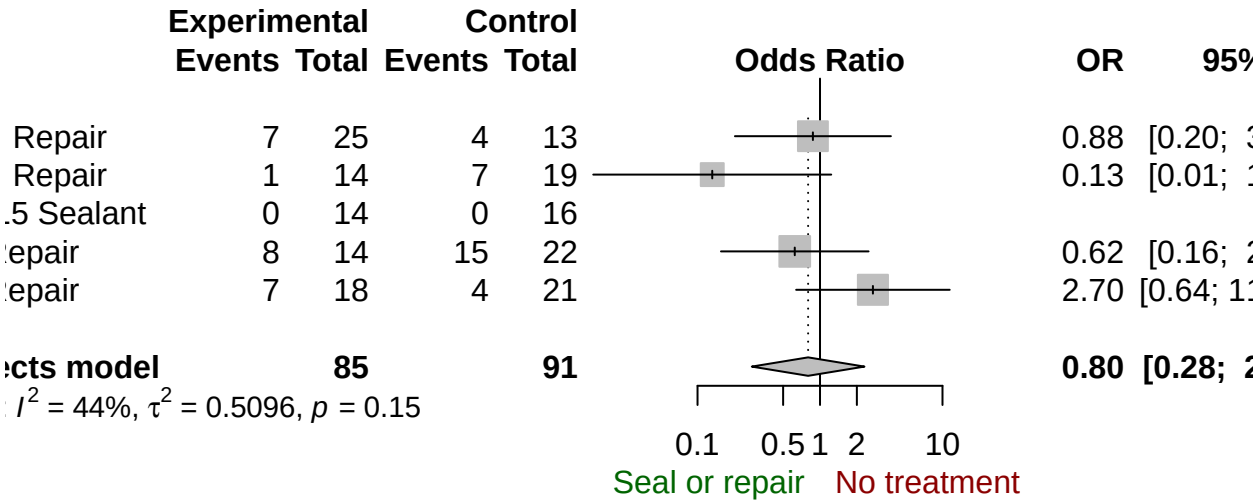
```
meta1
```

```
##                          OR            95%-CI %W(random)
## Gordan 2011 Repair   0.1319 [0.0141;  1.2354]       16.1
## Moncada 2015 Sealant     NA                            0.0
## Estay 2017 Repair    0.6222 [0.1554;  2.4920]       28.9
```

```
## Estay 2017 Repair    2.7045 [0.6384; 11.4576]       27.7
## Gordan 2009 Repair   0.8750 [0.2020;  3.7907]       27.3
##
## Number of studies combined: k = 4
##
##                          OR           95%-CI     z  p-value
## Random effects model 0.7996 [0.2774; 2.3052] -0.41   0.6789
##
## Quantifying heterogeneity:
##  tau^2 = 0.5096; H = 1.34 [1.00; 2.31]; I^2 = 44.1% [0.0%; 81.3%]
##
## Test of heterogeneity:
##     Q d.f.  p-value
##  5.37    3   0.1467
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
```

```
forest.meta(meta1,
       comb.fixed = FALSE,
       sortvar = year,
       # LEFT
       label.left          = "Seal or repair",
       col.label.left      = "darkgreen",
       # RIGHT
       label.right         = "No treatment",
       col.label.right     = "darkred")
```

```
## Warning: Unknown or uninitialised column: '.subset'.
```



---

5. Replacement SC (5)

Data selection

```
data_meta <- df %>%
  filter(groups == "Replacement SC")
data_meta
```

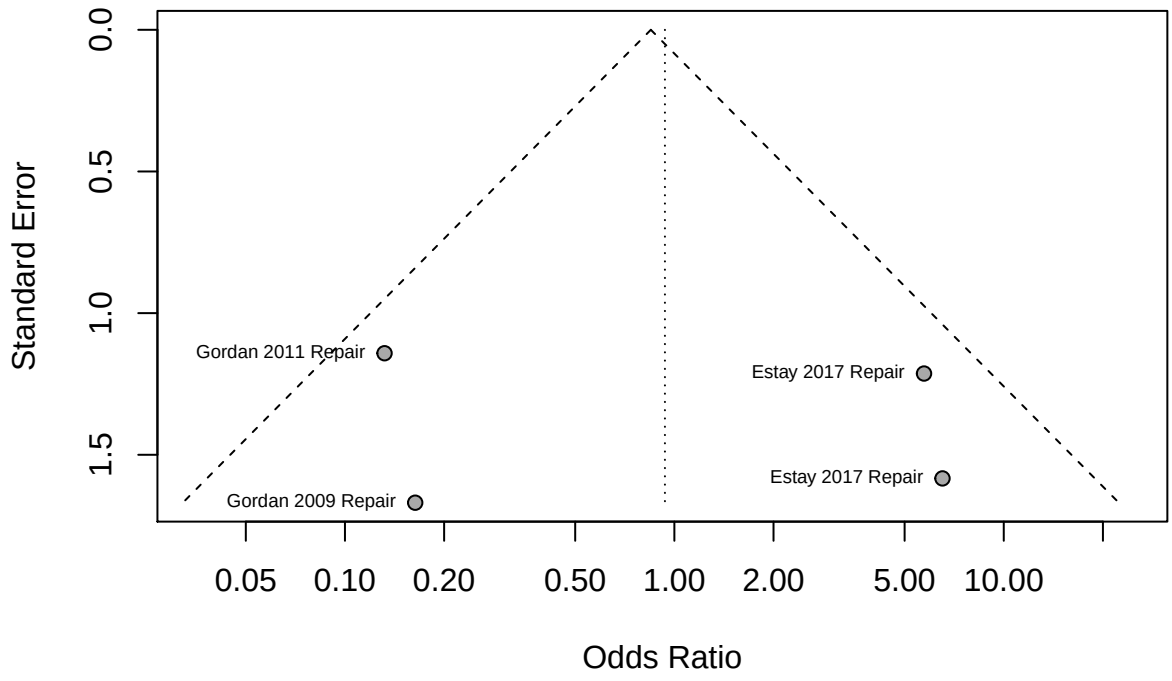
```
## # A tibble: 5 x 14
##                   Comparison  Material firstAuthor  year paper
##                        <chr>     <chr>       <chr> <chr> <chr>
## 1   Repair vs replacement Ag   Amalgam      Gordan  2011     b
## 2 Sealants vs replacement Ag   Amalgam     Moncada  2015     b
## 3   Repair vs replacement Kz Composite       Estay  2017     e
## 4   Repair vs replacement Ag   Amalgam       Estay  2017     b
## 5   Repair vs replacement Kz Composite      Gordan  2009     d
## # ... with 9 more variables: intervention_a <chr>, intervention_b <chr>,
## #   EvA <int>, TotalA <int>, EvB <int>, TotalB <int>, Outcome <chr>,
## #   id <chr>, groups <chr>
```

```
meta1 <- metabin(EvA, TotalA,
                 EvB, TotalB,
                 data = data_meta,
```

```
                sm="OR",  method.tau = "DL",
                comb.fixed = FALSE,
                studlab = paste(firstAuthor, year, intervention_a))
```

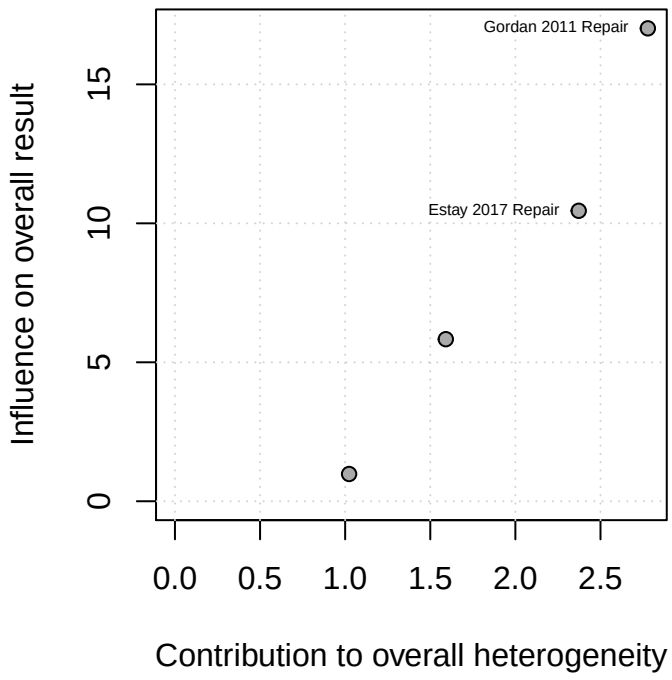
Bias

```
funnel.meta(meta1,
            studlab = TRUE,
            cex.studlab = .55)
```



Heterogeneity

```
baujat.meta(meta1,
            yscale = 10, xmin = 3, ymin = 10,
            cex.studlab = .50)
```



Meta-analysis and forest plot

```
summary(meta1)
```

```
## Number of studies combined: k = 4
##
##                          OR           95%-CI     z  p-value
## Random effects model 0.9363 [0.1065; 8.2309] -0.06   0.9526
##
## Quantifying heterogeneity:
##  tau^2 = 2.9848; H = 1.61 [1.00; 2.78]; I^2 = 61.4% [0.0%; 87.1%]
##
## Test of heterogeneity:
##     Q d.f.  p-value
##  7.77    3   0.0511
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
## - Continuity correction of 0.5 in studies with zero cell frequencies
```

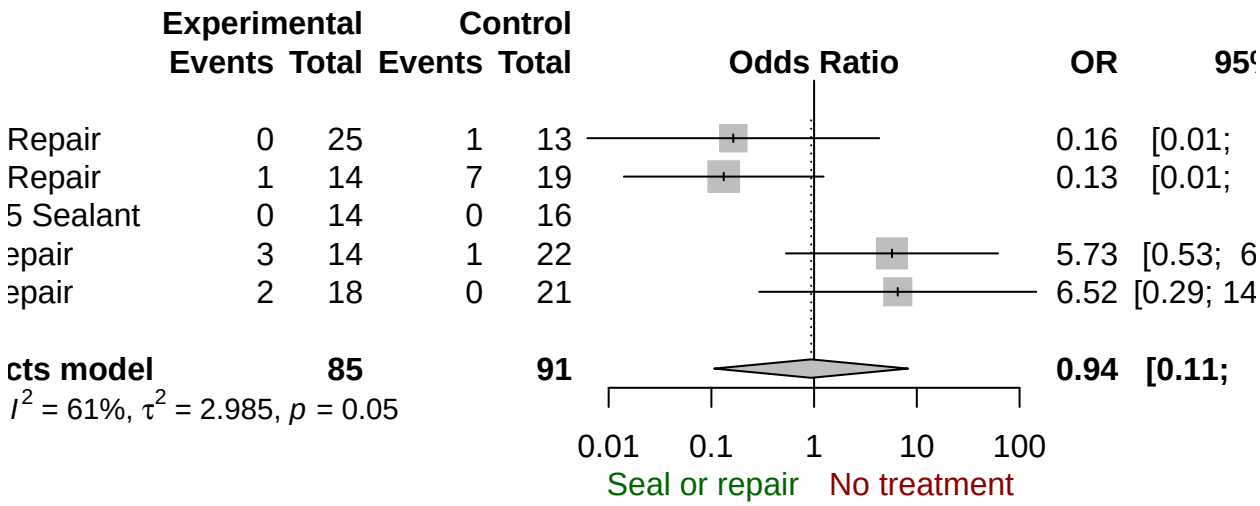
```
meta1
```

```
##                          OR             95%-CI %W(random)
## Gordan 2011 Repair   0.1319 [0.0141;   1.2354]       28.7
## Moncada 2015 Sealant     NA                            0.0
```

```
## Estay 2017 Repair    5.7273 [0.5312;  61.7487]       27.6
## Estay 2017 Repair    6.5152 [0.2925; 145.1132]       22.4
## Gordan 2009 Repair   0.1634 [0.0062;   4.3051]       21.3
##
## Number of studies combined: k = 4
##
##                          OR           95%-CI     z  p-value
## Random effects model 0.9363 [0.1065; 8.2309] -0.06   0.9526
##
## Quantifying heterogeneity:
##  tau^2 = 2.9848; H = 1.61 [1.00; 2.78]; I^2 = 61.4% [0.0%; 87.1%]
##
## Test of heterogeneity:
##     Q d.f.  p-value
##  7.77    3   0.0511
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
## - Continuity correction of 0.5 in studies with zero cell frequencies
```

```
forest.meta(meta1,
       comb.fixed = FALSE,
       sortvar = year,
       # LEFT
       label.left         = "Seal or repair",
       col.label.left     = "darkgreen",
       # RIGHT
       label.right        = "No treatment",
       col.label.right    = "darkred")
```

```
## Warning: Unknown or uninitialised column: '.subset'.
```



---

6. Replacement TS (5)

Data selection

```
data_meta <- df %>%
  filter(groups == "Replacement TS")
data_meta
```

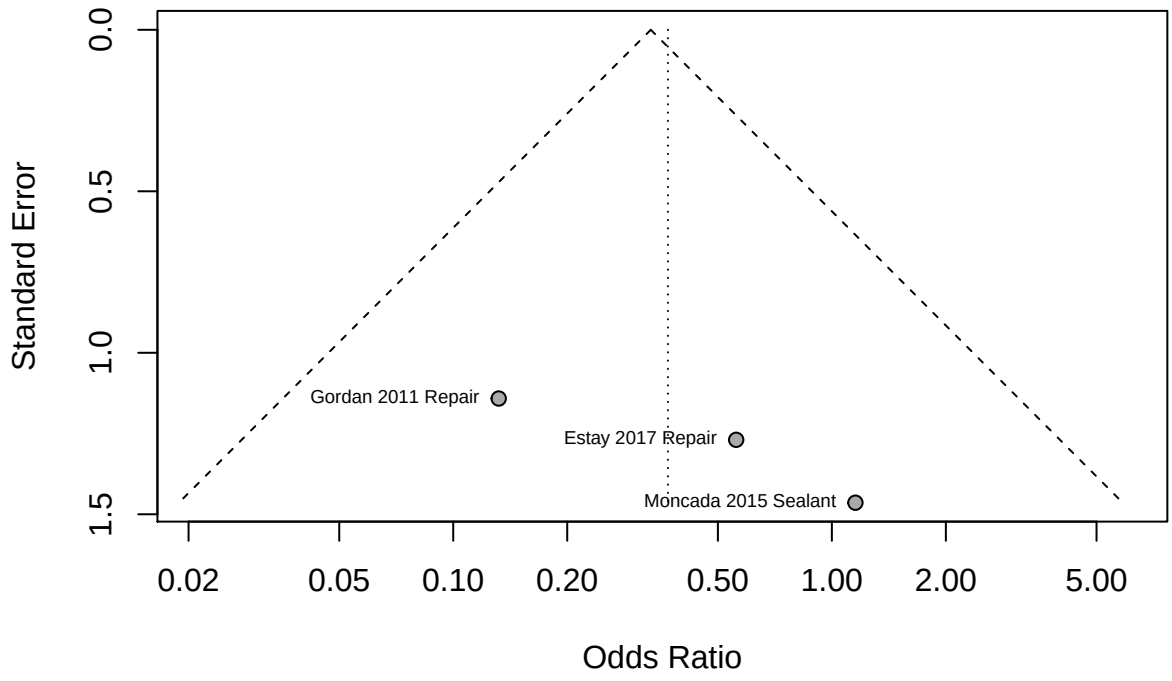
```
## # A tibble: 5 x 14
##                   Comparison  Material firstAuthor  year paper
##                        <chr>     <chr>       <chr> <chr> <chr>
## 1   Repair vs replacement Ag   Amalgam      Gordan  2011     b
## 2 Sealants vs replacement Ag   Amalgam     Moncada  2015     c
## 3   Repair vs replacement Kz Composite       Estay  2017     f
## 4   Repair vs replacement Ag   Amalgam       Estay  2017     c
## 5   Repair vs replacement Kz Composite      Gordan  2009     e
## # ... with 9 more variables: intervention_a <chr>, intervention_b <chr>,
## #   EvA <int>, TotalA <int>, EvB <int>, TotalB <int>, Outcome <chr>,
## #   id <chr>, groups <chr>
```

```
meta1 <- metabin(EvA, TotalA,
                 EvB, TotalB,
                 data = data_meta,
```

```
                sm="OR",  method.tau = "DL",
                comb.fixed = FALSE,
                studlab = paste(firstAuthor, year, intervention_a))
```

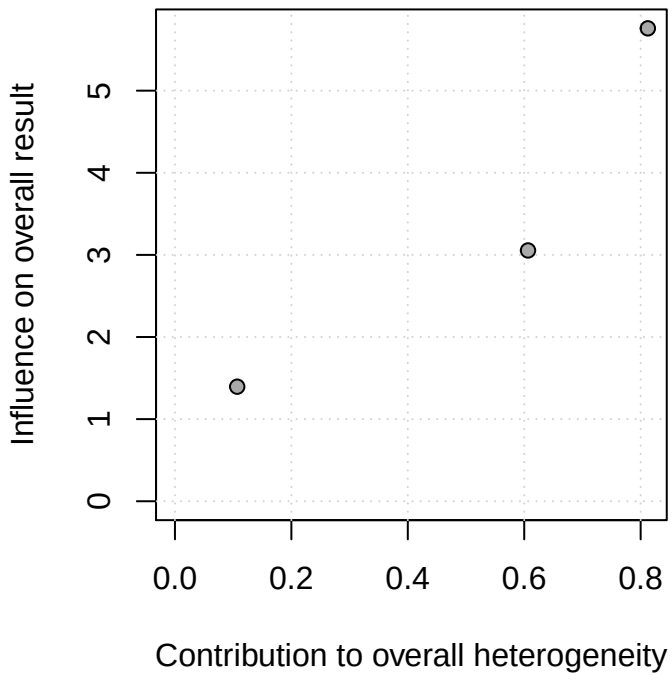
Bias

```
funnel.meta(meta1,
            studlab = TRUE,
            cex.studlab = .55)
```



Heterogeneity

```
baujat.meta(meta1,
            yscale = 10, xmin = 3, ymin = 10,
            cex.studlab = .50)
```



Meta-analysis and forest plot

```
summary(meta1)
```

```
## Number of studies combined: k = 3
##
##                          OR           95%-CI     z  p-value
## Random effects model 0.369 [0.0875; 1.5561] -1.36   0.1745
##
## Quantifying heterogeneity:
##  tau^2 = 0; H = 1.00 [1.00; 2.73]; I^2 = 0.0% [0.0%; 86.5%]
##
## Test of heterogeneity:
##     Q d.f.  p-value
##  1.55    2   0.4617
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
```

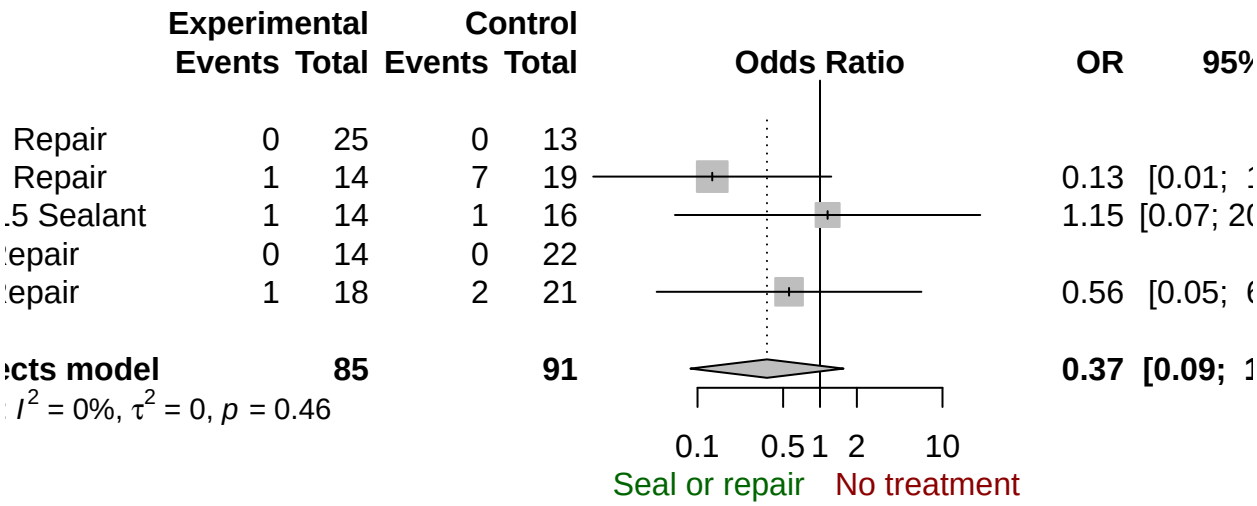
```
meta1
```

```
##                          OR            95%-CI %W(random)
## Gordan 2011 Repair   0.1319 [0.0141;  1.2354]       41.4
## Moncada 2015 Sealant 1.1538 [0.0654; 20.3419]       25.2
## Estay 2017 Repair        NA                          0.0
```

```
## Estay 2017 Repair    0.5588 [0.0464;  6.7269]       33.5
## Gordan 2009 Repair       NA                          0.0
##
## Number of studies combined: k = 3
##
##                          OR           95%-CI     z  p-value
## Random effects model 0.369 [0.0875; 1.5561] -1.36   0.1745
##
## Quantifying heterogeneity:
##  tau^2 = 0; H = 1.00 [1.00; 2.73]; I^2 = 0.0% [0.0%; 86.5%]
##
## Test of heterogeneity:
##     Q d.f.  p-value
##  1.55    2   0.4617
##
## Details on meta-analytical method:
## - Mantel-Haenszel method
## - DerSimonian-Laird estimator for tau^2
```

```
forest.meta(meta1,
       comb.fixed = FALSE,
       sortvar = year,
       # LEFT
       label.left          = "Seal or repair",
       col.label.left      = "darkgreen",
       # RIGHT
       label.right         = "No treatment",
       col.label.right     = "darkred")
```

```
## Warning: Unknown or uninitialised column: '.subset'.
```



Citations

```
citation()
```

```
##
## To cite R in publications use:
##
##   R Core Team (2017). R: A language and environment for
##   statistical computing. R Foundation for Statistical Computing,
##   Vienna, Austria. URL https://www.R-project.org/.
##
## A BibTeX entry for LaTeX users is
##
##   @Manual{,
##     title = {R: A Language and Environment for Statistical Computing},
##     author = {{R Core Team}},
##     organization = {R Foundation for Statistical Computing},
##     address = {Vienna, Austria},
##     year = {2017},
##     url = {https://www.R-project.org/},
##   }
##
```

```
## We have invested a lot of time and effort in creating R, please
## cite it when using it for data analysis. See also
## 'citation("pkgname")' for citing R packages.
```

```
citation(package = "tidyverse")
```

```
##
## To cite package 'tidyverse' in publications use:
##
##   Hadley Wickham (2017). tidyverse: Easily Install and Load the
##   'Tidyverse'. R package version 1.2.1.
##   https://CRAN.R-project.org/package=tidyverse
##
## A BibTeX entry for LaTeX users is
##
##   @Manual{,
##     title = {tidyverse: Easily Install and Load the 'Tidyverse'},
##     author = {Hadley Wickham},
##     year = {2017},
##     note = {R package version 1.2.1},
##     url = {https://CRAN.R-project.org/package=tidyverse},
##   }
```

```
citation(package = "meta")
```

```
##
## To cite package 'meta' in publications use:
##
##   Guido Schwarzer (2007), meta: An R package for meta-analysis, R
##   News, 7(3), 40-45.
##
## A BibTeX entry for LaTeX users is
##
##   @Article{,
##     title = {meta: {A}n {R} package for meta-analysis},
##     author = {Guido Schwarzer},
##     journal = {R News},
##     year = {2007},
##     volume = {7},
##     number = {3},
##     pages = {40--45},
##   }
##
## URL https://cran.r-project.org/doc/Rnews/Rnews_2007-3.pdf
```